Sri Krishna College of Engineering and Technology

An Autonomous Institution, Affiliated to Anna University

Coimbatore – 641 008

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(CYBER SECURITY)

CURRICULUM AND SYLLABI

B.E COMPUTER SCIENCE AND ENGINEERING

(Cyber Security)

REGULATION 2022 (2023-2027 Batch)

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING
(CYBER SECURITY)

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(Cyber Security)

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ABOUT THE DEPARTMENT

VISION

To be a globally renowned academic department for quality education and research in the field of Cyber security with ethical values and social commitment.

MISSION

To accomplish our vision, we are committed to:

M1: Impart comprehensive technical education to produce highly competent Cyber security professionals and Researchers.

M2: Provide an academic environment with state-of-the-art technological infrastructure to provide scalable cyber security solutions.

M3: Impart ethics, Social responsibility and necessary professional, leadership skills through student centric activities.

PROGRAMME OUTCOMES (POs)

Graduates will be able to:

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

PO2 - **Problem analysis:** Identify, formulate, review research literature, and 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.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

To enable graduates to:

1. Get recognized as effective professionals for their applied skills, problem solving capabilities and professional skills in the field of cyber security.

2. Enrich skills and adopt emerging cyber security needs to pursue life-long learning and serve the society with social concern and code of ethics.

PROGRAMME SPECIFIC OUTCOMES (PSO)

Upon completion of the programme, graduates will have ability to:

PSO1 Attain the policies in information assurance and analyze the factors in an existing system and design implementations to comprehend and anticipate future challenges.

PSO2 Implement innovative cyber security solutions using standard tools, practices and technologies without compromising the privacy of individuals and entities.

PSO3 Use cyber security and cyber forensics software/tools. Design cyber-security strategies and assess cyber-security risk management policies to protect an organization's information and assets.

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	2	2		1	2	2	2	1
PEO 2	2	2	2	1	2	3	2	2	2	2	2	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	2	2		1	2	1	1	2
PSO 2	3	3	3	3	3	2			2		1	2
PSO3	3	3	3	2	3	2		1	2	1	1	2

Mapping of PSO's & PEO's

Programme Specific Outcomes (PSO)	Programme Educational Objectives (PEO)	
	PEO1	**PEO2**
1	3	2
2	3	2
3	3	2

1	Reasonably agreed	**2**	Moderately agreed	**3**	Strongly agreed

SEMESTER I							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
1	**23MA101**	Mathematics I	3/1/0	4	4	60/40	BSC
2	**23IT101**	Application Development Practices	1/0/4	5	3	50/50	ESC
3	**23CS101**	Problem Solving using C++	1/0/4	5	3	50/50	ESC
4	**23EN101**	Oral and Written Communication Skills	2/0/2	3	3	50/50	HSMC
5	**23CY101**	Networking and Communication	3/0/2	4	4	60/40	ESC
6	**23TA101**	Heritage of Tamils	1/0/0	1	1	60/40	HSMC
MANDATORY COURSE							
7	**23MC101**	Mandatory Course I (Induction Programme)	Three weeks		0	0/100	MC
			Total	**22**	**18**	**700**	

SEMESTER II							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
1	**23MA201**	Mathematics II	3/1/0	4	4	60/40	BSC
2	**23AS101**	Applied Science	4/0/0	4	4	60/40	BSC
3	**23CS201**	Data Structures and Algorithms	1/0/4	5	3	50/50	PCC
4	**23CD201**	Database Management Systems	1/0/4	5	3	50/50	PCC
5	**23CY201**	Object Oriented Programming using Java	1/0/4	5	3	50/50	PCC
6	**23CY202**	Operating Systems	3/0/2	5	4	50/50	ESC
7	**23TA201**	Tamils and Technology	1/0/0	1	1	60/40	HSMC
8	**23AS102**	Applied Science Laboratory	0/0/4	4	2	40/60	BSC
			Total	**33**	**24**	**800**	

SEMESTER III							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
1	**23CY301**	Cyber Law & Digital Forensics	3/1/0	4	4	60/40	PCC
2	**23MA301**	Mathematical Foundations for Computer Science	3/1/0	4	4	60/40	ESC
3	**23GE201**	Universal Human Values	3/0/0	3	3	60/40	HSMC
4	**23IT301**	Web Technology using React	1/0/4	5	3	50/50	PCC
5	**23CS301**	Advanced Java Programming	1/0/4	5	3	50/50	PCC
6	**23AD301**	Design and analysis of algorithms	1/0/4	5	3	50/50	PCC
MANDATORY COURSE							
7	**23MC1XX**	Mandatory Course: II	2/0/0	2	0	0/100	MC
			Total	**28**	**20**	**700**	

SEMESTER IV							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
1	**23CY401**	Ethical Hacking	3/1/0	4	4	60/40	PCC
2	**23IT401**	Web Frameworks using REST API	1/0/4	5	3	50/50	PCC
3	**23AD403**	Managing Cloud and Containerization	1/0/4	5	3	50/50	PCC
4	**23CS401**	Software Testing	1/0/4	5	3	50/50	PCC
5	**23CY402**	Access Control and Identity management	3/0/2	5	4	50/50	PCC
6	**23CY403**	Auditing IT Infrastructure for Compliance	3/0/2	5	4	50/50	PCC
			Total	**29**	**21**	**600**	

SEMESTER V							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
1	**23AD403**	Python for Data Science	3/0/0	3	3	60/40	PCC
2	**23CY501**	Internet Security	3/1/0	4	4	60/40	PCC
3	**23OEXXX**	Open Elective 1	3/1/0	4	4	60/40	OEC
4	**23CY502**	Cloud Security	3/1/0	4	4	50/50	PCC
5	**23CYXXX**	Professional Elective – I	3/0/0 (or) 0/0/6	3	3	60/40 (or) 40/60	PEC
6	**23CYXXX**	Professional Elective – II	3/0/0	3	3	50/50	PEC
7	**23AD405**	Python for Data Science Laboratory	0/0/4	4	2	40/60	PCC
PROJECT WORK							
8	**23CY503**	Mini Project I	0/0/4	4	2	40/60	PW
			Total	**29**	**25**	**800**	

SEMESTER VI							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
1	**23CYXXX**	Emerging Elective – I	3/1/0	4	4	60/40	EEC
2	**23IT701**	Computational Biology	3/0/0	3	3	60/40	ESC
3	**23CY601**	Hacker Techniques Tools and Incident Handling	3/1/0	4	4	50/50	PCC
4	**23CY602**	Security Policies and Implementation	3/1/0	4	4	50/50	PCC
5	**23CYXX**	Professional Elective – III	3/0/0 (or) 0/0/6	5	3	60/40 (or) 40/60	PEC
6	**23CYXX**	Professional Elective – IV	3/0/0	3	3	50/50	PEC
			Total	**26**	**21**	**600**	

SEMESTER VII							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
1	**23CYXXX**	Professional Elective – V	3/1/0	4	4	60/40	PEC
2	**23CYXXX**	Professional Elective – VI	3/1/0	4	4	60/40	PEC
3	**23CYXXX**	Open Elective – II	3/1/0	4	4	60/40	OEC
4	**23CYXXX**	Emerging Elective – II	3/1/0	4	4	60/40	EEC
5	**23CD401**	Algorithms of Internet	3/0/2	5	4	50/50	PCC
6	**23EES01**	Employability Enhancement Skills	0/0/2	2	2	50/50	EES
			Total	**19**	**22**	**600**	

SEMESTER VIII							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credits**	**Ext/Int**	**Category**
PROJECT WORK							
1	**23CY801**	Project Work Phase I	0/0/24	24	12	40/60	PW
			Total	**24**	**12**	**100**	

Humanities and Management Courses (8 credits)

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	**23EN101**	Oral and Written Communication Skills	2/0/2	3	2	50/50	HSMC
2	**23TA101**	Heritage of Tamils	1/0/0	1	1	60/40	HSMC
3	**23TA201**	Tamils and Technology	1/0/0	1	1	60/40	HSMC
4	**23GE201**	Universal Human Values	3/0/0	3	3	60/40	HSMC

Basic Science Courses (14 credits)

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	**23MA101**	Mathematics I	3/1/0	4	4	60/40	BSC
2	**23MA201**	Mathematics II	3/1/0	4	4	60/40	BSC
3	**23AS101**	Applied Science	4/0/0	4	4	60/40	BSC
4	**23AS102**	Applied Science Laboratory	0/0/3	3	1.5	40/60	BSC

Engineering Science Courses (21 credits)

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/ Int	Category
1	**23IT101**	Application Development Practices	1/0/4	5	3	50/50	ESC
2	**23CS101**	Problem Solving using C++	1/0/4	5	3	50/50	ESC
3	**23CY101**	Networking and Communication	3/0/2	4	4	60/40	ESC
4	**23CY202**	Operating Systems	3/0/2	5	4	50/50	ESC
5	**23MA301**	Mathematical Foundations for Computer Science	3/1/0	4	4	60/40	ESC
6	**23IT701**	Computational Biology	3/0/0	3	3	60/40	ESC

Professional Core Courses (68 credits)

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	**23CS201**	Data Structures and Algorithms	1/0/4	5	3	50/50	PCC
2	**23CD201**	Database Management Systems	1/0/4	5	3	50/50	PCC
3	**23CY201**	Object Oriented Programming using Java	1/0/4	5	3	50/50	PCC
4	**23IT301**	Web Technology using React	1/0/4	5	3	50/50	PCC
5	**23CS301**	Advanced Java Programming	1/0/4	5	3	50/50	PCC
6	**23AD301**	Design and analysis of algorithms	1/0/4	5	3	50/50	PCC
7	**23CY301**	Cyber Law and Digital Forensics	3/1/0	4	4	60/40	PCC
8	**23IT401**	Web Frameworks using REST API	1/0/4	5	3	50/50	PCC
9	**23AD401**	Managing Cloud and Containerization	1/0/4	5	3	50/50	PCC
10	**23CS401**	Software Testing	1/0/4	5	3	50/50	PCC

11	**23CY402**	Access Control and Identity management	3/0/2	5	4	50/50	PCC
12	**23CY403**	Auditing IT Infrastructure for Compliance	3/0/2	5	4	50/50	PCC
13	**23CY401**	Ethical Hacking	3/1/0	4	4	60/40	PCC
14	**23CY502**	Cloud Security	3/1/0	4	4	60/40	PCC
15	**23AD403**	Python for Data Science	3/0/0	3	3	60/40	PCC
16	**23CY501**	Internet Security	3/1/0	4	4	60/40	PCC
17	**23AD405**	Python for Data Science Laboratory	0/0/3	3	2	40/60	PCC
18	**23CY601**	Hacker Techniques Tools and Incident Handling	3/0/2	5	4	50/50	PCC
19	**23CY602**	Security Policies and Implementation	3/0/2	5	4	50/50	PCC
20	**23CD401**	Algorithms of Internet	3/0/2	5	4	50/50	PCC

Professional Elective Courses

S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credit**	**Ext/Int**
Professional Elective – I							
1.	**23CY901**	Security in Wireless Sensor Networks	3	0	0	3	60/40
2.	**23CY902**	Artificial Intelligence in Cyber Forensics	3	0	0	3	60/40
3.	**23CY903**	Malware Analysis	3	0	0	3	60/40
4.	**23AD901**	App Development	0	0	6	3	40/60
Professional Elective – II							
5.	**23CY904**	Data Privacy and Security	3	0	0	3	60/40
6.	**23CY905**	Biometric Security	3	0	0	3	60/40
7.	**23CY906**	Network Security and Penetration Testing	3	0	0	3	60/40
Professional Elective – III							
8.	**23CY907**	Managing IT Security and Risk	3	0	0	3	60/40
9.	**23CY908**	Cyber Crime and Digital Forensics	3	0	0	3	60/40
10.	**23AD004**	Data Visualization using R	3	0	0	3	60/40
11.	**23IT902**	Cloud Architecture	0	0	6	3	40/60
Professional Elective – IV							
12.	**23CY909**	Emerging Cyber security Risks	3	0	0	3	60/40
13.	**23CY910**	Optimization Techniques	3	0	0	3	60/40
14.	**23CY911**	Mobile Device Forensics	3	0	0	3	60/40
Professional Elective – V							
15.	**23CY912**	Offensive Security	3	1	0	4	60/40
16.	**23CY913**	Cyber Threat Intelligence and Analytics	3	1	0	4	60/40
17.	**23AD501**	Big Data Analytics	3	1	0	4	60/40
Professional Elective – VI							
18.	**23CY914**	Crypto currency Engineering and Design	3	1	0	4	60/40
19.	**23CY915**	Internet of Things Security	3	1	0	4	60/40
20.	**23CY916**	Smart Grid Cyber Security	3	1	0	4	60/40

Open Elective Courses

S.No.	Course Code	Course	L	T	P	Credit	Ext/Int
1.	**23CY111**	Cyber Security Fundamentals	3	1	0	4	60/40
2.	**23CY112**	Cryptography – Tools and Techniques	3	1	0	4	60/40
3.	**23CY113**	Cybersecurity Auditing and Assurance	3	1	0	4	60/40
4.	**23CY114**	Web security	3	1	0	4	60/40
5.	**23CY115**	Operating System Security	3	1	0	4	60/40
6.	**23CY116**	Security Governance, Risk and compliance	3	1	0	4	60/40

Emerging Elective Courses

Emerging Elective Course - Stream 1							
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credit**	**Ext/Int**
1	**23CY007**	Application Security	3	1	0	4	60/40
2	**23CY008**	Dependable Computing	3	1	0	4	60/40
3	**23CY009**	Security and Privacy of Cyber Physical Systems	3	1	0	4	60/40
Emerging Elective Course - Stream 2							
4	**23CY010**	LDAP Directory Services	3	1	0	4	60/40
5	**23CY011**	Proactive Security Tools and Techniques	3	1	0	4	60/40
6	**23CY012**	Jenkins and Kubernetes	3	1	0	4	60/40

Value Added Courses

S.No.	Course Code	Course	Credit	Category
1.	**23VA140**	Kali Linux	1	VAC
2.	**23VA141**	Wireshark	1	VAC
3.	**23VA130**	Effective Communication Skills	2	VAC

Mandatory Courses

S.No.	Course Code	Course Title	Category
1	**23MC101**	Induction Programme	MC
2	**23MC102**	Environmental Sciences	MC
3	**23MC103**	Soft Skills	MC
4	**23MC104**	Management Organizational Behaviour	MC
5	**23MC105**	General Aptitude	MC
6	**23MC106**	Life Skills and Ethics	MC
7	**23MC107**	Stress Management	MC
8	**23MC108**	Constitution of India	MC
9	**23MC109**	Essence of Indian Traditional Knowledge	MC

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

S. No	Stream	Credits/Semester								Credits	AICTE Norms
		I	II	III	IV	V	VI	VII	VIII		
1.	Humanities and Management Courses(HSMC)	4	1	3						**8**	**16**
2.	Basic Science Courses (BSC)	4	10							**14**	**23**
3.	Engineering Science Courses (ESC)	10	4	4			3			**21**	**29**
4.	Professional Core Courses (PCC)		9	13	21	13	8	4		**68**	**59**
5.	Professional Elective Courses (PEC)					6	6	8		**20**	**12**
6.	Open Elective Courses (OEC)					4		4		**8**	**9**
7.	Emerging Elective Courses (EEC)						4	4		**8**	**-**
8.	Project Work(PW)					2			12	**14**	**15**
9.	Employability Enhancement Courses (EES)							2		**2**	**-**
10.	Mandatory Courses (MC)									**Non credit**	**-**
Total		**18**	**24**	**20**	**21**	**25**	**21**	**22**	**12**	**163**	
AICTE		**17.5**	**20.5**	**23**	**22**	**21**	**22**	**18**	**15**		**163**

23MA101	MATHEMATICS I	3/1/0/4
Nature of Course		
Pre requisites	-	
Course Objectives:		
1	To use logical notation to define the fundamental data types and structures used in computer algorithms and systems.	
2	To use the concepts of graph theory in practical situations.	
3	To acquire thorough knowledge of fundamental notions of proof's and its application in Cryptography.	
4	To analyse data pertaining to discrete and continuous random variables to interpret the results.	
5	To impart the knowledge of counting principles, to think critically and apply it in real world problems.	
Course Outcomes(Theory) **Upon completion of the course, students shall have ability to**		
C101.1	Recall the basic concepts of logical laws, structures and probability.	[R]
C101.2	Understand the concepts of proof techniques, structures and random variables.	[U]
C101.3	Apply the logical and foundational structures of mathematics with an emphasis on writing proofs.	[AP]
C101.4	Apply the concepts of graph and number theory in cryptography.	[AP]
C101.5	Apply the probability concepts in transition from real problem to a probabilistic model.	[AP]

Course Contents:

MODULE I : LOGICAL PROOF'S & FUNCTIONS (20 Hrs)

Proofs: Definitions - Proof by cases - Proof by contradiction - Logical formulas - Propositions - Truth table - Logical operators - Tautologies and Contradictions – Contrapositive - Equivalences and implications - Predicates - Free and bound variables – Quantifiers - Universe of discourse - **Sets:** Basic sets - Operations on Sets – Law on Sets (without proof) - Cartesian product of sets. **Relations:** Types of relations and their properties - Relational matrix and graph of a relation - Equivalence relations - Partial ordering relation - Graphical representation of relations - Binary relation - **Functions:** Classifications of functions – Induction - Ordinary induction and Strong induction - Recursive data types - Definition of recursive and structural induction.

MODULE II : NUMBER THEORY & GRAPH THEORY (20 Hrs)

Number Theory: Divisibility - Greatest common divisor - Euclid's algorithm - Prime numbers - Fundamental theorem of arithmetic - Modular arithmetic - Remainder arithmetic - Multiplicative inverses and cancelling - Relatively prime - Euler's theorem.- Chinese Reminder Theorem **Graph Theory:** Vertices and Degrees - Types of graphs - Handshaking theorem - Adjacency matrices - Walks and paths - Directed acyclic graphs and scheduling – Isomorphism - Bipartite graphs and Matchings - The Stable marriage problem – Connectivity - Forests and trees - Spanning trees - Minimum weight spanning trees - Prims algorithm - Kruskal algorithm..

MODULE III : COUNTING & PROBABILITY (20 Hrs)

Sums and Asymptotics - Sums of Powers-Harmonic Numbers - Asymptotic Notation -The Division Rule - Counting Subsets - Sequences with Repetitions - The Pigeonhole Principle -Events and Probability Spaces - The Four Step Method-Set Theory and Probability - Conditional Probability - The Four-Step Method for Conditional Probability - The Law of Total Probability - Baye's theorem – Independence - Mutual Independence - Pairwise Independence - Random Variables - Distribution Functions - Bernoulli Distributions - Uniform Distributions - Binomial Distributions - Great Expectations - Conditional Expectation - Linearity of Expectation - Infinite Sums - Expectations of Products

Total Hours:	**60**

Text Books:	
1	Tremblay J.P and Manohar R, “Discrete Mathematical Structures with applications to Computer Science”, Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
2	Koshy. T, “Elementary Number Theory with Applications”, Elsevier Publications, New Delhi, Second Edition, 2007.
3	Eric Lehman, F. Thomson Leighton and Albert R. Meyer, “Mathematics for Computer Science”, 14thEdition, MIT Open courseware, 2018.
Reference Books:	
1	Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, “Discrete Mathematical Structures”, sixth edition, Pearson Education Pvt Ltd., New Delhi, 2017
2	Kenneth H. Rosen, “Discrete Mathematics and its Applications”, Eighth Edition, Tata McGraw – Hill Pub. Co. Ltd., New Delhi, Eighth Edition, 2021.
3	Thomas Koshy, “Discrete Mathematics with Applications”, Elsevier Publications, 2004.
4	P. Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, Fifth Edition, Pearson Education Asia, New Delhi, Fifth Edition, 2019.
Web References:	
1	https://onlinecourses.nptel.ac.in/noc23_cs109/preview
2	https://onlinecourses.nptel.ac.in/noc23_cs120/preview
3	https://onlinecourses.nptel.ac.in/noc23_ma77/preview
4	https://onlinecourses.nptel.ac.in/noc23_ma72/preview
Online Resources:	
1	https://www.coursera.org/specializations/discrete-mathematics
2	https://www.cs.ucdavis.edu/~rogaway/classes/20/fall21/mit-book.pdf
3	https://mathworld.wolfram.com/topics/DiscreteMathematics.html
4	https://mathworld.wolfram.com/topics/NumberTheory.html

Assessment Methods & Levels (based on Blooms’ Taxonomy)

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	Remember	Quiz	20
C101.2	Understand	Presentation	20
C101.3 – C101.5	Apply	Tutorial	20
C101.3 – C101.5	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	20	20	20
Understand	30	30	30
Apply	50	50	50
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)**	

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)(Theory)															
COs	**POs**												**PSOs**		
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**1**	**2**	**3**
C101.1	1	1											1		
C101.2	2	2											1		
C101.3	3	3													
C101.4	3	3											1		
C101.5	3	3													
	3 Strongly agreed | 2 Moderately agreed | 1 Reasonably agreed														

23IT101	APPLICATION DEVELOPMENT PRACTICES	1/0/4/3
Nature of Course	F (Theory programming)	
Pre requisites	Nil	

Course Objectives:

1.	To discuss the essence of agile development methods.
2.	Ability to understand and apply Scrum framework.
3.	To set up and create a GitHub repository.
4.	To impart the knowledge of web application development platforms.
5.	To create interactive websites using HTML, CSS.
6.	To recognize the user experience design methodologies like Java script for responsive web design.

Course Outcomes

Upon completion of the course, students shall have ability to

C101.1	Make use of the concept of agile software engineering and its advantages in software development.	[AP]
C101.2	Demonstrate the values and practices of Scrum and how to setup the GitHub repository.	[U]
C101.3	Find the working model and learn basic web concepts to develop Static and Dynamic websites.	[R]
C101.4	Utilize the knowledge of HTML, CSS and Bootstrap to build modern interactive web applications.	[AP]
C101.5	Develop dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.	[AP]

Course Contents:

Module - I: 15 Hours

History of Traditional Software Development Model, Software Development Model and SDLC, “Waterfall Model” – An Overview, Waterfall or Sequential Based Development Model, “Real Life” – Waterfall Model, “Waterfall Model” – Advantages, “Waterfall Model” – Disadvantages, Agile Software Development – Definition, Agile Development Model, Graphical Illustration of Agile Development Model, Why use Agile?, Agile Manifesto and Principles, 12 Principles of Agile Methods, Agile Values, What is NOT an Agile software development?, Foundation of an Agile software development Method, Common Characteristics of Agile Methods, Agile Methods and Practices, When to use Agile Model?, Advantages of Agile Model, Disadvantages of Agile Model, Difference between Agile and Waterfall Model, Agile – Myths and Reality, Agile Market Insight. Introduction to SCRUM, Scrum Roles and Responsibilities, Scrum Core Practices and Artifacts, User Story, Sprint, Release Planning Meeting, Sprint Planning Meeting, Daily Scrum Meeting (Daily Stand up), Sprint Review Meeting, Retrospective, Product Backlog, Sprint Backlog, Burn-Down Chart, Velocity, Impediment Backlog. Definition of “Done”, Splitting User Story into Task, Why to Split User Story into Task?, Guidelines for Breaking Down a User Story into Tasks, Examples of Scrum Task Board, Planning Poker®, Planning Poker - Process/Steps, What are Story Points?, How do We Estimate in Story Points?, What Goes into Story Points? Introduction to Extreme Programming, The Rules of Extreme Programming, Extreme Programming (XP) – Principles, Extreme Programming (XP) – Key Terms, Introduction to Lean Software Development, Principles of Lean Software Development, What is Kanban? Introduction to Git - Getting a Git Repository, Recording Changes to the Repository, Viewing the Commit History, Undoing Things, Working with Remotes, Tagging, Git Aliases, Git Branching, Branches in a Nutshell, Basic Branching and Merging, Branch Management, Remote Branches, Rebasing. Introduction to GitHub – Introduction, Set up Git, Create a repository, GitHub Flow, Contribution to Projects, Communicating on GitHub. Linux Basic Commands - Linux Basic Commands, Linux File Permissions, Basic System Administration, Process Management, Archival. Linux Shell Script - Shell Basics, Writing first script, Conditional statements, Loops, Command line arguments, Functions & file manipulations, Background processes, Scheduling processes -At, batch & Cron -Networking.

Module - II: 15 Hours

HTML Basics - Understand the structure of an HTML page, New Semantic Elements in HTML 5, Learn to apply physical/logical character effects, Learn to manage document spacing. Tables - Understand the structure of an HTML table, Learn to control table format like cell spanning, cell

spacing, border. List - Numbered List, Bulleted List, Working with Links, Understand the working of hyperlinks in web pages, Learn to create hyperlinks in web pages, Add hyperlinks to list items and table contents. Image Handling - Understand the role of images in web pages, Learn to add images to web pages, Learn to use images as hyperlinks. Frames - Understand the need for frames in web pages, Learn to create and work with frames. HTML Forms for User Input - Understand the role of forms in web pages, Understand various HTML elements used in forms, Single line text field, Text area, Check box, Radio buttons, Password fields, Pull-down menus, File selector dialog box. New Form Elements - Understand the new HTML form elements such as date, number, range, email, search and data list, Understand audio, video, article tags.

Module - III: **15 Hours**

Introduction to Cascading Style Sheets - What CSS can do, CSS Syntax, Types of CSS. Working with Text and Fonts - Text Formatting, Text Effects, Fonts. CSS Selectors - Type Selector, Universal Selector, ID Selector, Class selector. Colors and Borders – Background, Multiple Background, Colors RGB and RGBA, HSL and HSLA, Borders, Rounded Corners, Applying Shadows in border, Implementing CSS3 in the "Real World" – Modernizr, HTML5 Shims, SASS, and Other CSS Preprocessors, CSS Grid Systems, CSS Frameworks. Introduction to Bootstrap – Introduction, Getting Started with Bootstrap, Bootstrap Basics, Bootstrap grid system, Bootstrap Basic Components, Bootstrap Components, Page Header, Breadcrumb, Button Groups, Dropdown, Nav & Navbars. JavaScript Essentials - Var, Let and Const keyword, Arrow functions, default arguments, Template Strings, String methods, Object de-structuring, Create, apply, prototype, bind method, Spread and Rest operator, Typescript Fundamentals, Types & type assertions, Creating custom object types, function types, Typescript OOPS - Classes, Interfaces, Constructor, Decorator & Spread Operator, Difference == & === , Asynchronous Programming in ES6, Promise Constructor, Promise with Chain, Promise Race.

Total Hours	**45**

Lab Component:

S. No	List of Experiments
1	Design a web page using HTML basic tags.
2	Develop web site with suitable contents and links.
3	Design web pages using lists and tables.
4	Build a web client-side Login, Registration form and Dashboard with drop down menus.
5	Develop a HTML form and validation using HTML5 features.
6	Create a website using HTML: To embed an image map in a web page. To fix the hot spots. Show all the related information when the hot spots are clicked.
7	Apply style specification in HTML page using CSS.
8	Develop dynamic web application using HTML, CSS and JavaScript.
Total Hours	**30**

Text Books:

1.	Roman Pichler, “Agile Product Management with Scrum Creating Products that Customers Love”, Pearson Education, 1st Edition, 2010.
2.	Jeff Sutherland, “Scrum the Art of Doing Twice the Work in Half the Time”, Random House Publisher,1st Edition, 2015.
3.	Scott Chacon, Ben Straub, “Pro GIT”, CreateSpace Independent Publishing Platform, 2017.
4.	Richard Blum, Christine Bresnahan, “Linux Command Line and Shell Scripting BIBLE”, Wiley India Pvt. Limited, 2020.
5.	Jennifer Niederst Robbins., “Learning Web Design, A beginner's guide to HTML, CSS, JavaScript, and Web Graphics”, O'Reilly Media, 5th Edition, 2018.

6.	Jennifer Smith and the AGI Creative Team, “Web Design with HTML and CSS”,Wiley Publisher,1st Edition, 2011.
7.	Stephen Blumenthal, “JavaScript: JavaScript for Beginners - Learn JavaScript Programming with ease”,1st Edition, 2017.
Reference Books:	
1.	Robert C. Martin, “Agile Software Development, Principles, Patterns and Practices”, Prentice Hall, 2nd Edition, 2014.
2.	Mike Cohn, “User Stories Applied: For Agile Software”, Addison Wesley,2nd Edition, 2016.
3.	Thomas a Powell, “HTML & CSS: The Complete Reference”, 5th Edition, Tata McGraw Hill Education Private Limited, 2010.
4.	Russ Ferguson, “Beginning JavaScript: The Ultimate Guide to Modern JavaScript Development”, Apress Publishers, 3rd Edition, 2019.
5.	Deitel, Deitel, Goldberg, “Internet and World Wide Web – How to program”, 5th Edition, Prentice Hall Publishers, 2012.
Web References:	
1.	https://www.coursera.org/specializations/agile-development
2.	https://www.edx.org/learn/agile
3.	https://nptel.ac.in/courses/106/105/106105182/
4.	https://developer.mozilla.org/en-US/docs/Web/HTML
5.	https://developer.mozilla.org/en-US/docs/Web/CSS
6.	https://developer.mozilla.org/en-US/docs/Web/JavaScript
Online Resources:	
1.	http://www.agilenutshell.com/
2.	https://www.atlassian.com/agile/scrum
3.	https://www.youtube.com/user/AgileMikeCohn
4.	https://www.coursera.org/learn/html-css-javascript-for-web-developers
5.	https://online-learning.harvard.edu/subject/javascript

Continuous Assessment									**End Semester Practical 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]**
C101.1	Apply	Assignment - 1	**20**
C101.2, C101.3	Understand Remember	Quiz	**20**
C101.4	Apply	Case Study	**20**
C101.5	Apply	Assignment - 2	**20**

Assessment based on Summative - Theory		
Bloom's Level	**Summative Assessment (15%) [120 Marks]**	
	CIA1: (60 Marks)	**CIA2: (60 Marks)**
Remember	40	20
Understand	30	30
Apply	30	50
Analyse	-	-
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	20	20
Understand	20	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
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 Outcomes (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	2	2	1	1								2	3	2	2
C101.2	3	2	3	3	3	2						2	3	3	2
C101.3	3	2	3	3	3	2						2	3	3	2
C101.4	3	2	3	3	3	2						2	3	3	2
C101.5	3	2	3	3	3	2						1	3	3	2

23CS101	Problem Solving using C++	1/0/4/3
Nature of Course	C(Theory Concept), K (Problem Programming)	
Pre requisites	NIL	

Course Objectives:

1	To learn the fundamental programming concepts and methodologies which are essential to build good C++ programs.
2	To gain knowledge on control structures and functions in C++.
3	To provide the basic object-oriented programming concepts and apply them in problem solving.
4	To introduce file streams and operations for storing data permanently.
5	To know generic programming paradigm.

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

C101.1	Solve problems using operators and control Statements.	[AP]
C101.2	Write C++ programs for processing strings and arrays.	[AP]
C101.3	Apply the concepts of pointers and functions in programs.	[AP]
C101.4	Develop C++ programs using various object-oriented concepts to solve real world problems.	[A]
C101.5	Implement the concepts on file streams and operations.	[AP]

Course Contents:

Module I C++ Programming Fundamentals **15 Hours**

C vs C++, Basic of OOPS, the main () function, Header files, Basic Input and Output (I/O) using cin and cout, Variable, Constant. **Operators:** Arithmetic Operators, Assignment Operators, Relational Operators, Logical Operators, Bitwise Operators, Other Operators, Operator Precedence. Control Statements: if, if...else and Nested if...else, switch..case, break and continue, Loops - for loop, while loop, do while loop, goto. **Arrays and Strings:** 1D array, 2D array, Strings, String functions. **Function:** Basics, call by value, call by reference & return by reference, Inline function, overloading Functions, inline Functions, Recursive Functions. **Pointers:** Pointer, Dynamic Memory Allocation.

Module II Object Oriented Concepts **15 Hours**

Classes and Objects, public, private, protected. **Constructors and destructors**: Overloaded Constructor, Copy Constructor, Shallow Copying Deep Copying. **Overloading:** this' Pointer, structs vs Classes, Friends of a class, Operator Overloading, Inheritance, Overloading vs Overriding, Polymorphism, Virtual Functions, Pure Virtual Functions and Abstract Classes.

Module III Files and Generic Programming **15 Hours**

Abstract Classes as Interfaces, Exception, Files, Streams and I/O, STL, Generic Programming, Lambda Expression.

Total Hours (Theory)	**45**

Lab Component

S.No.	Lab Exercise
1.	Practice of C Programming using Branching and Iterative constructs.
2.	Programs using arrays and strings
3.	Programs using Functions
4.	Programs using Structures and Pointers.
5.	Programs using classes and objects
6.	Programs using constructor and destructor
7.	Programs using method overloading, operator overloading and polymorphism concepts.
8.	Programs using friend class
9.	Programs using virtual functions and abstract class.
10.	Programs using inheritance concepts
11.	Programs using exception handling concept
12.	Programs using Files.
13.	Mini project

Total Hours (Lab)	**30**
Total Hours(45+30)	**75**

Text Books:	
1.	E Balagurusamy,"Object Oriented Programming With C++", 4th Edition, Tata McGraw-Hill Education, 2008.
2.	YashavantP. Kanetkar, "Let us C++", BPB Publications, 2020.
3.	M. Sprankle, "Problem Solving and Programming Concepts", 9th Edition, Pearson Education, New Delhi, 2011.
Reference Books:	
1.	Herbert Schildt, "The Complete Reference C++", 4th Edition, MH, 2015.
2.	John Hubbard, "Schaum's Outline of Programming with C++", MH, 2016.
Web References:	
1.	https://www.geeksforgeeks.org/c-plus-plus/
2.	http://web.stanford.edu/class/cs106l/
Online Resources:	
1.	https://nptel.ac.in/courses/106101208
2.	https://www.hackerrank.com/domains/cpp
3.	https://codeforces.com/blog/entry/74684
4.	https://www.hackerearth.com/practice/notes/tricky-and-fun-programming-in-c/

Continuous Assessment									**End Semester Practical 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]**
C101.1	Apply	Quiz	20
C101.2 & C101.3	Apply	Assignment	20
C101.4	Analyze	Group Assignment	20
C101.5	Apply	Case Study	20

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

Assessment based on Summative Assessment - Theory		
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**	
	CIA1: (60 Marks)	**CIA2: (60 Marks)**
Remember	10	10
Understand	40	40
Apply	40	40
Analyse	10	10
Evaluate	-	-
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**
C101.1	3	3											3		
C101.2	3	3	3	2	2				2	1		3	3	2	1
C101.3	3	3	3	2	3				2	1		3	3	2	1
C101.4	3	3	3	3	3				3	2		3	3	2	2
C101.5	3	3	3	3	3				2	2		2	3	2	1
C101	**3**	**3**	**3**	**3**	**3**				**3**	**2**		**2**	**3**	**2**	**2**

23EN101	ORAL AND WRITTEN COMMUNICATION SKILLS	3/0/2/4
Nature of Course	Theory Skill Based	
Pre requisites	Basics of English Language	

Course Objectives:

1	To empower students to comprehend different aspects of communication using LSRW skills.
2	To highlight the essential aspects of effective oral and written communication necessary for professional success.
3	To expand the skills of the students in preparing job search artefacts and negotiating their use in GDs and interviews.
4	To enable students to communicate contextually in specific, personal and professional situations with courtesy.
5	To enrich students to carry out day-to-day communication at the workplace and facilitate efficient interpersonal communication.

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

C101.1	Remember and expand writing skills through guided activities.	R
C101.2	Apply communication skills in a corporate environment.	AP
C101.3	Analyse and collaborate better with colleagues, building stronger professional and personal relationships.	AN
C101.4	Apply technical writing skills to write letters, emails and prepare technical documents.	AP
C101.5	Analyze and communicate effectively in personal and professional situations.	AN

Course Contents:

Module I

Reading : Reading techniques -Skimming and scanning - Cloze reading - Reading and understanding technical articles – Reading for detailed comprehension: Email and letters - Reading advertisements - Table completion: Interpreting charts and graphs - Verbal reasoning – Comprehending reviews – Reading and responding to instant messages.

Module II

Writing : Formal letters (Sales letter, calling for quotations, seeking clarification, placing an order, complaint letter, inviting, accepting and declining letters) - Emails - Minutes of meeting - Professional report writing - Proposal writing - Resume / job application letter - Case study.

Module III

Listening : Situational listening - Listening about an experience - Listening about short extracts - Listening an interview - Conversational speaking. Speaking : Conversational speaking - Decipher the picture given and answer the question posed along with it - Decipher the mind map given and speak about it - Listen to the questions posed and answer them appropriately.

Lab Components

1	Conversational listening	[U]
2	Speaking - Pictography	[AP]
3	Listening about an experience	[U]
4	Listening to short extracts	[U]
5	Writing - Resume Writing, Job application letter	[AP]
6	Mock interview	[AP]
	Total Hours:	60

Text Books:	
1	Jay Sullivan, “Simply Said: Communicating Better at Work and Beyond”, Wiley Publication, 2018.
2	Alred J Gerald, Brusaw T Charles,. Oliu E Walter, “Handbook of Technical Writing”, Bedford/St. Martin’s Boston publication,New York, 2012.
3	Liz Hamp-Lyons and Ben Heasly, “Study Writing :A Course in Written English for Academic Purposes”, Updated Edition, Cambridge University Press, 2006.
4	Dr.Praveen Sam and K N Shoba - A Course in Technical English by Cambridge University press, 2020.
Reference Books:	
1	Rutherfoord J Andrea, “ Basic Communication Skills for Technology”, Upper Saddle River, N.J. : Prentice Hall, 2001.
2	Singh Hardeep (Author), Kothari (Author), “Written & Oral Technical Communication Skills For Engineers/Scientists” - LAMBERT Publications, 2019.
Web References:	
1	http://www.academiccourses.com/Courses/English/Business-English
2	https://www.liveworksheets.com/worksheets/en/English_as_a_Second_Language_(ESL)/Technical_English
Online Resources:	
1	https://www.coursera.org/specializations/business-english
2	https://www.businessenglishresources.com/learn-english-for-business/student-section/practice-exercises-new/

Assessment									**End Semester Examinatio Continuous n**	**Total**
Theory				**Practical**			**Total (A+B)**	**Total Continuous Assessmen t**		
Form ative Asses sment	**Summative Assessmen t**	**Tota l**	**Tota l (A)**	**Formative Assessment**	**Summativ e Assessme nt**	**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 C101.2	Understand	Listening to Short Extracts	**20**
C101.3	Apply	Speaking - Pictography	**20**
C101.4	Apply	Mock Interview	**20**
C101.5	Apply	Assignment	**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	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyse	-	-	-
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	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcomes (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					
C101.2								2		3					
C101.3								2		3	2				
C101.4										3					
C101.5										3		3			

23CY101	NETWORKING AND COMMUNICATIONS	3/0/2/4
Nature of Course	C (Theory Practical)	
Prerequisites	Nil	
Course Objectives:		
1.	To study different layers of ISO/OSI reference architecture.	
2.	To understand the error detection and correction methods.	
3.	To study the concepts of sub netting and routing mechanisms.	
4.	To understand the types of protocols and network components.	
5.	To study and configure Switches and Routers.	
Course Outcomes		
Upon completion of the course, students shall have ability to		
C101.1	Understand network models, protocols, network devices, and topologies to design and manage efficient and secure networks.	[U]
C101.2	Illustrate error detection, correction methods and interpret different network technologies.	[U]
C101.3	Experiment the configuration of routers, switches, firewalls, and other network devices.	[AP]
C101.4	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and routing technologies.	[A]
C101.5	Analyze the different network security concepts like security threats, vulnerabilities, and risk management strategies.	[A]

Course Contents:

Fundamentals of Networking: 15 Hours

Introduction to Data Communication and Networking, Networks Topologies, ISO/OSI model, TCP / IP model and protocols, Performance Metrics. Different types of transmission media, errors in transmission: Attenuation, Noise. Encoding (NRZ, NRZI, Manchester, 4B/5B), Networking Devices: Hubs, Bridges, Switches, Routers and Gateways, Network Security Fundamentals. Case study: A comparative analysis of TCP/IP and OSI models in real-world network implementations.

Network Protocols and Technologies 15 Hours

Data Link Layer: Addressing, Error detection (Parity, CRC, Hamming code), Sliding Window, Stop and Wait protocols, LAN: Design, specifications of popular technologies, switching, Bluetooth, Wi-Fi, Wi-Max, FDDI, PPP. MAC Layer**:** Aloha, TDMA, CDMA, CSMA/CD, CSMA/CA. Network layer**:** Internet Protocol, IPv4, IPv6, ARP, DHCP, ICMP, Distance vector routing, Link state routing, Classless Inter-domain routing, RIP, OSPF, BGP, Subnetting, Network Address Translation. Case study: IP address planning and subnetting for a geographically dispersed organization.

Advanced Networking and Applications 15 Hours

Transport layer and Application Layer: UDP, TCP, Socket Programming. Application Layer: DNS, E-Mail -SMTP, MIME, POP3, IMAP, FTP, HTTP, HTTPS, SSL, WWW, Software-Defined Networking (SDN) and Network Function Virtualization (NFV), Multimedia Communication and Streaming, Emerging Technologies in Networking (5G, edge computing, etc.), Securing web applications, Mobile Phone security, Data Tracking. Case study: Evaluating the impact of 5G and edge computing on the future of network communication.

Total Hours	**45**

Lab Component	
S. No.	**Lab Exercises**
1	Basic Network Setup: Set up a simple network with multiple computers connected to a switch and a router. Configure IP addresses, subnet masks, and default gateways
2	VLAN Configuration: Create multiple VLANs on a switch, assign ports to specific VLANs, and configure inter-VLAN routing using a router.
3	Router Configuration: Configure a router with static routes, dynamic routing protocols (like RIP, OSPF), and implement NAT (Network Address Translation) for internet access.
4	Access Control Lists (ACLs): Implement ACLs on routers or switches to control traffic flow between different network segments based on specific rules.
5	DHCP Configuration: Set up a DHCP server on a router or server, configure DHCP pools, and observe how clients obtain IP addresses automatically.
6	Wireless Network Setup: Create a wireless network with a router and wireless access points. Configure SSIDs, security settings, and observe wireless client connections.
7	Network Address Translation (NAT): Experiment with different NAT types (static, dynamic, PAT) to understand how they map private IP addresses to a single public IP address.
8	VPN Configuration: Set up a virtual private network (VPN) between two routers, using protocols like IPsec, and establish a secure communication channel.
9	Spanning Tree Protocol (STP): Create a network with redundant links, and observe how STP works to prevent loops and ensure a loop-free topology.
10	IPv6 Configuration: Configure IPv6 addresses on routers and hosts, and observe how IPv6 routing and addressing work in comparison to IPv4.

Text Books:	
1.	A S Tanenbaum, DJ Wetherall, “Computer Networks”, 6th Edition, Prentice-Hall, 2021.
2.	Behrouz A. Forouzan, “Data communication and Networking”, 5th Edition, Tata McGraw- Hill, 2013.
3.	Andrei Gurtov, Madhusanka Liyanage, Mika Ylianttila, Software Defined Mobile Networks (SDMN) Beyond LTE Network Architecture, Wiley, 2021
Reference Books:	
1.	Peterson & Davie, "Computer Networks, A Systems Approach", 6th Edition, Elsevier, 2021.
2.	William Stallings, “Data and Computer Communications”, 10th Edition, PHI, 2013.
3.	Xingqin Lin, Namyoon Lee 5G and Beyond Fundamentals and Standards, Springer, 2021
4.	JF Kurose, KW Ross, “Computer Networking: A Top-Down Approach”, 6th Edition, Addison-Wesley, 2021.
5.	Dariusz Gasior Resource Allocation for Software Defined Networks, 1st edition, Springer, 2020
Web References:	
1.	https://www.geeksforgeeks.org/network-and-communication/
2.	https://www.britannica.com/science/computer-science/Networking-and-communication
3.	https://www.ibm.com/docs/en/aix/7.2?topic=management-network-communication-concepts
Online Resources:	
1.	https://onlinecourses.nptel.ac.in/noc22_ee61/preview

2.	https://www.iit.edu/academics/programs/networking-and-communications-certificate
3.	https://www.shiksha.com/online-courses/network-security-associate-course-nsel13

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]**
C101.1, C101.2	Understand	Quiz	**20**
C101.3	Apply	Tutorial	**20**
C101.4, C101.5	Analyze	Tech Exploration Assignment	**20**
		Seminar	**20**

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	20
Understand	40	30	30
Apply	30	40	40
Analyse	10	10	10
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	20	20	20
Apply	50	40	40
Analyse	20	30	30
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**

SA 1 (60M)	FA 1		SA 2 (60M)	FA 2		FA (75M)	SA (25M)	(35%) Practical Examination (15%)
	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	2	-	-	-	-	-	-	-	-	2	2	2	-
C101.2	3	3	3	3	2	-	-	-	-	-	-	3	3	3	3
C101.3	3	3	3	3	2	-	-	-	-	-	-	3	3	3	2
C101.4	1	2	2	1	3	-	-	-	-	-	-	2	2	1	-
C101.5	3	2	3	2	2	-	-	-	-	-	-	2	3	2	-

23TA101	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, VilluPattu, KaniyanKoothu, 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	தமிழகவரலாறு – மக்களும்பண்பாடும்–கே.கே.பிள்ளை(வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர்இல. சுந்தரம் . (விகடன்பிரசுரம்).
3	கீழடி – வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4	பொருநை – ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
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	-	-	-	-	-	-

23MC101	INDUCTION PROGRAMME	1/0/0/0
Nature of Course	InductionProgramme	
Pre requisites	Nil	
Course Objectives:		
1.	To have broad understanding of society and relationships	
2.	To nurture the character and fulfil one's responsibility as an engineer, a citizen and a human being	
3.	To incorporate meta skills and values	
Course Outcomes: **Upon completion of the course, students shall have ability to**		
C101.1	Explore academic interest and activities	[AP]
C101.2	Work for excellence	[AP]
C101.3	Promote bonding and give a broader view of life and character	[AP]

Course Contents:

PHYSICAL ACTIVITY: Research over the past years has shown Yoga to have stress-relieving powers on students, paving the way for improved academic performance with the practice of asanas, meditation and breathing exercises. To prove these words Yoga classes has been planned in this module.(CO mapping: C101.1, C101.2, C101.3)

CREATIVE ARTS (students can select any one of their choice): Cultural development supports students to understand, feel comfortable with, value and appreciate the potential enrichment of cultural diversity. They should challenge discrimination, whether based on cultural or racial difference. Students should experience cultural traditions embedded in arts, crafts, language, literature, theatre, song, music, dance, sport, Science, technology and travel. Students should develop an appreciation of beauty both in experiencing artistic expression and by exploring their own creative powers. To inculcate those skills they are given a chance to exhibit their talents through painting, sculpture, pottery, music, dance, craft making and so on. .(CO mapping: C101.1, C101.2, C101.3)

UNIVERSAL HUMAN VALUES: Moral development involves supporting students to make considered choices around their behaviour and the values that provide a framework for how they choose to live. Moral development is also learning about society's values, understanding the reasons for them, how they are derived and change; and how disagreements are resolved. Students must consider the consequences of personal and societal decisions on the wider community – local and global- and on the environment and future generations. To acquire this the students are exposed to training to enhance their soft skills. .(CO mapping: C101.1, C101.2, C101.3)

LITERARY AND PROFICIENCY MODULES: Social development helps students to work effectively together, developing the inter-personal skills required to relate positively with their peers and people of all ages. Students must also understand how to participate productively in a diverse and plural society and learn about, and how to effectively engage with societal institutions and processes. They should understand that a person may have different roles and responsibilities within society. To reach this the following aspects are given in the form of Reading, writing, speaking – debate, role play etc.Communication and computer skills. (CO mapping: C101.1, C101.2, C101.3)

LECTURES BY EMINENT PEOPLE: Teaching with Lectures. ... It is essential to see lectures as a means of helping students learn to think about the key concepts of a particular subject, rather than primarily as a means of transferring knowledge from instructor to student. During the induction period students will attend to Guest lectures by subject experts.(CO mapping: C101.1, C101.2, C101.3)

VISIT TO LOCAL AREAS:Traveling is in fact a way of learning to learn. You are out of your comfort zone and so you must learn to be able to adapt to a new learning environment in a very short time. It also helps in your overall learning as well. In the induction period students will be taken to different places near college to learn new things. Eg.Meditation centre/orphanage/Hospital.(CO mapping: C101.1, C101.2, C101.3)

FAMILIARIZATION TO DEPARTMENT/BRANCH INNOVATION: Hod's of different branches will present about their department followed by department visit to view various facilities available at their department, new innovations from students and faculties etc. .(CO mapping: C101.1, C101.2, C101.3)

Course Articulation Matrix (Lab)															
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1						3	3	3	3	3	3	3			1
2						3	3	3	3	3	3	3			1
3						3	3	3	3	3	3	3			1

23MA201	MATHEMATICS II CSE/IT/AI&DS/CSD/CYBER/EEE/ECE/MCT	3/1/0/4

Nature of Course	J (Problem analytical)
Prerequisites	-

Course Objectives:

1	To study the basic probability concepts
2	To apply mathematical linear programming techniques to solve constrained problems.
3	To formalize the notion of strategic thinking and rational choice by using the tools of game theory
4	To acquaint the student with transform techniques which are used in variety of engineering fields.
5	To introduce the concepts of Group theory

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

C201.1	Recall the concepts of basic probability	[R]
C201.2	Formulate and analyze the existence of solutions to optimization problems	[U]
C201.3	Formulation of modern Probability Theory and think of random variables as an intrinsic need for the analysis of random phenomena.	[AP]
C201.4	To apply game theory in searching, auctioning and trading.	[AP]
C201.5	Apply Fourier transform to discrete time sequence and use of group theory and coding theory in communication.	[AP]

Course Contents

MODULE 1: Probability theory (20 hrs)

Deviation from mean- Markov's theorem – Chebyshev's theorem - properties of variance – sums of random variables – Gambler's ruin - Random walk on graphs - Chebyshev's inequality – weak law of large numbers – Van der Waerden's theorem - Chernoff bounds – Deviation on sum of independent random variables – other versions of Chernoff Bound.

MODULE 2: Linear Programming & Game Theory (20 hrs)

Basics of Linear Programming – Formulations of Linear Programming Problems - The Simplex Method - Linear Programming in Matrix Form – Two phase method - Duality - The Transportation Problem - Game theory: Introduction - Zero-Sum Matrix Games – payoff matrix - The Minimax and Maximin theorem - mixed strategies – graphic solution of games.

MODULE 3: Fourier Analysis & Group Codes (20 hrs)

Fourier series – Discrete Fourier transform – Computing using convolution of sequences using Fast Fourier transform – Fourier transforms modulo p and faster integer multiplication. Concept and simple Applications of Groups, subgroups, cosets – linear codes – error correcting codes – hamming codes – perfect codes.

Total Hours:	**60 Hrs**

Text Books:

1	H. Pishro-Nik, "Introduction to probability, statistics, and random processes", Kappa Research LLC, 2014.
2	Hamdy A. Taha, Operations Research: An Introduction, 10th Edition, Pearson,2019.
3	T Veerarajan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGrawHill, New Delhi, 2007.

4.	Erwin Kreyszig, ”Advanced Engineering Mathematics”, 13th Edition, John Wiley & Sons, Inc.
Reference Books:	
1	S.C. Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, twelth edition, Sulthan Chand and sons,2014.
2	Eric Lehman, F.Thomson Leighton and Albert R.Meyer, Mathematics for Computer Science, 14thEdition, MIT Open courseware, 2018.
3	Kanti Swarup, P.K.Gupta, Manmohan, Operations research, 2nd Edition, Sultan Chand and Sons, 2015
Web References:	
1	https://archive.nptel.ac.in/courses/111/105/111105090/
2	https://archive.nptel.ac.in/courses/110/104/110104063/
3	https://archive.nptel.ac.in/courses/111/101/111101164/
4	https://archive.nptel.ac.in/courses/111/106/111106113/
Online Resources:	
1	http://discrete.openmathbooks.org/dmoi3.html
2	https://www.csie.ntu.edu.tw/~sylee/courses/dm/resources.htm
3	https://www.maa.org/press/ebooks/resources-for-teaching-discrete-mathematics
4	https://see.stanford.edu/Course/EE261/137

Summative assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%)						**End Semester Examination (60 %)**
CA 1 (20 Marks)			**CA2 (20 Marks)**			**Theory Examination (60 Marks)**
SA 1 (12 Marks)	**FA 1**		**SA 2 (12 marks)**	**FA 2**		
	Component -I (4 marks)	**Component –II (4 marks)**		**Component -I (4 marks)**	**Component - II (4 marks)**	

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model (16%)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**Marks**
C201.1	Remember	Quiz	4
C201.2	Understand	Assignment	4
C201.3 - C201.4	Apply	Presentation	4
C201.5	Apply	Tutorial	4

Summative assessment based on Continuous and End Semester Examination			
Bloom's Level	**Continuous Assessment (24%)**		**End Semester Examination (60%)**
	CIA1 [12 Marks]	**CIA2 [12 Marks]**	**[60 Marks]**
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcomes (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										1		
C201.2	1	2	1										2		
C201.3	3	3	2										2		
C201.4	1	1	2										1		
C201.5	2	1	2										2		

23AS101	APPLIED SCIENCE (Common to B.E. CSD, CSE, CSE (CYBER SECURITY), ECE, EEE, MCT & B.Tech. AI&DS, IT	L/T/P/C 4/0/0/4

Nature of Course	**: E (Theory based)**
Pre requisites	**: Fundamental knowledge in applied sciences**

Course Objectives:

1	**To learn the fundamental, concepts of physics and apply this knowledge to both scientific and engineering problems.**
2	**To make the students enrich basic knowledge in various fields such as Electrostatics and magnetism.**
3	**To understand the principle and applications of electrochemistry and Polymer science, and explore the knowledge of various energy sources and storage devices.**
4	**To understand the concepts of photo-physical and photochemical processes in spectroscopy.**

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

C101.1	**Understand the principles of electrostatics and problems relating to electric field and electric potential.**	**[U]**
C101.2	**Realize the nature of magnets, properties and the magnetic effect of electric current.**	**[U]**
C101.3	**Describe the nature of electromagnetic wave and its propagation through different media and interfaces involved in different situations.**	**[AP]**
C101.4	**Understand the principle and working of reference electrodes, energy storage devices and polymer products in engineering fields.**	**[U]**
C101.5	**Interpret the principle and working of analytical techniques.**	**[AP]**

Course Contents:
Electrostatics:
15 hours
Charges and their conservation; Coulomb's law - superposition principle. Electric field – electric field due to a point charge, electric field lines; electric dipole, electric field intensity due to a dipole - behaviour of a dipole in a uniform electric field. Electric potential - potential difference - electric potential due to a point charge and dipole - equipotential surfaces – electrical potential energy of a system of two point charges. Electric flux-Gauss's law and its applications. Electrostatic induction-capacitor and capacitance – dielectrics- electric polarisation – parallel plate capacitor with and without dielectric – applications of capacitor – energy stored in a capacitor - Capacitors in series and in parallel – Van de Graaff generator.

Magnetism:
15 hours
Definitions of fundamental terms – Magnetic field around a current carrying conductor – Direction of magnetic field and current – Biot-Savart law and its application: Magnetic field due to Line charge – Ampere's law and its application: magnetic field due to a solenoid.
Electromagnetic Induction and Alternating Current:
Electromagnetic induction - Faraday's law - induced emf and current - Lenz's law. Self-induction - Mutual induction - self-inductance of a long solenoid - mutual inductance of two long solenoids. Methods of inducing emf - (i) by changing magnetic induction (ii) by changing area enclosed by the coil and (iii) by changing the orientation of the coil. AC generator - (Single phase, three phase). Eddy current - applications - transformer - Alternating current - AC circuit with resistance - AC circuit with inductor - AC circuit with capacitor - LCR series circuit - Resonance and Q - factor - power in AC circuits.

Chemistry of Batteries and Polymers:
15 hours
Chemistry of batteries-Introduction-Cells and its types-emf series-Nernst equation and its applications. Reference electrodes-standard hydrogen electrode, saturated calomel electrode, glass electrode-pH-measurement. Discussion of energy storage-Lead acid, Nickel cadmium and Lithium-ion batteries-Energy Sources-Fuel cells (H_2-O_2). Polymers-Classifications-addition and condensation polymerization-free radical mechanism. Atomic and molecular Spectroscopy: Beer Lambert's law, principle, instrumentation, and applications of electronic spectroscopy (UV-visible), Vibrational and rotational spectroscopy (IR) and atomic spectrum-Flame emission spectroscopy (FES).

Total Hours:	**45**
Text Books:	
1	**Rajendran, V "Engineering Physics" Mc Graw Hill Publications ltd, New Delhi, 2017.**
2	**David Halliday, Robert Resnick, Jearl Walker "Fundamentals of Physics", 11th edition, Wiley, 2018.**
3	**Gaur, R.K. and Gupta, S.L., "Engineering Physics", DhanpatRai Publishers, 2017.**
4	**Bhattacharya, D.K. and Poonam, T., "Engineering Physics", Oxford University Press, 2017.**
5	**Dara S.S, Umare S.S, "Engineering Chemistry", First revised Edition by S. Chand & Company Ltd., New Delhi 2015.**
6	**Jain P. C. & Monica Jain., "Engineering Chemistry", 17 th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, Reprint-2020.**
7	**Fundamentals of Molecular Spectroscopy, 4 th Edition by C. N. Banwell Publishing McGraw-Hill Book Company (P) Ltd, England, 2001.**
Reference Books:	
1	**Avadhanulu M.N., Kshirshagar P.G., Arun Murthy TVS "A Text Book of Engineering Physics"S.Chand& Co Ltd, 2018.**
2	**Sadiku M H, "Principles of Electromagnetics", Oxford University Press Inc.,New Delhi,2015**
3	**R. Wolfson, "Essential University Physics", Volume 1 & 2. Pearson, 2020.**
4	**S.O. Kasap, "Principles of Electronic Materials and Devices", McGraw Hill Education, 2017.**

5	David Griffiths 'Introduction to Electrodynamics' 4th Edition, Cambridge University Press 2017.
6	Perez, Nestor," Electrochemistry and Corrosion Science", Springer, 2016.
7	Ghazi A.Karim. "Fuels, Energy and the Environment", CRC Press, Taylor and Francis group, 2012.
Web References:	
1	https://nptel.ac.in/courses/115101005
2	https://www.udemy.com/course/electrostatics-1-electric-charges-fields-and-related-laws/
3	https://openlearninglibrary.mit.edu/courses/course-v1:MITx+8.02.1x+1T2019/about
4	https://onlinecourses.nptel.ac.in/noc22_ph31/preview
5	https://ocw.mit.edu/courses/8-02t-electricity-and-magnetism-spring-2005/
6	https://unacademy.com/batch/legend-2o-for-jee-main-and-advanced-2022/7IXHRCZE/topics/WQCLD/courses/RAATL
7	https://archive.nptel.ac.in/courses/108/106/108106073/
8	https://www.kth.se/.../electrochem/welcome-to-the-division-of-applied-electrochemistry
9	www.corrosionsource.com/
10	https://www.sciencedirect.com/book/9780750646253/battery
11	http://www.rnlkwc.ac.in/pdf/study-material/chemistry/Spectroscopy
12	https://ocw.mit.edu/courses/chemistry
13	nptel.ac.in/courses/105106112/1_introduction/5_corrosion.pdf
14	https://ocw.mit.edu/courses/chemistry

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	tTotal	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	Assignment - I	20
C101.2	Understand	Quiz - I	20
C101.3	Apply		
C101.4	Understand	Assignment - II	20
C101.5	Apply	Quiz – II	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	30	30
Understand	50	50	50
Apply	20	20	20
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 Outcomes (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**	**2**		**1**							**1**			
C101.2	**3**	**2**	**2**		**1**							**1**			
C101.3	**3**	**2**	**2**	**1**	**1**							**1**			
C101.4	**3**	**2**	**2**		**1**							**1**			
C101.5	**3**	**2**	**2**	**1**	**1**							**1**			

23CS201	Data Structures and Algorithms	1/0/4/3

Nature of Course:	F (Theory Programming)
Prerequisites:	Problem Solving using C++

Course Objectives:

1.	To introduce list data structure and its applications.
2.	To impart the importance of stacks and queues in problem solving.
3.	To provide knowledge on Tree and Graph data structures.
4.	To discuss the role of hashing in information storage and retrieval.

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

C201.1	Implement the basic data structures like array and LinkedList.	[AP]
C201.2	Solve real world problems efficiently by applying stack and queue data structures.	[AP]
C201.3	Illustrate the applications of tree data structures.	[AP]
C201.4	Discuss the importance of hashing techniques in information storage.	[AP]
C201.5	Employ graph algorithms for solving real time computing problems and analyze them.	[A]

Course Contents:

Module I Linked List & Stack **15 Hours**

Linked List: Array vs Linked list - Types of linked list - Singly, Doubly and Circular Linked list - Applications of linked list. **Stack:** Stack Model**,** Array and Linked list implementation of Stack –Applications of Stack - Infix, Prefix and Postfix expressions - infix to postfix conversion - Expression Evaluation- Balancing Parenthesis.

Module II Queue and Trees **15 Hours**

Queue: Queue Model, Array and Linked list implementation of Queue-Priority Queue - Applications of Queue. **Trees:** Binary Tree - Binary Search Tree - Insertion, Deletion, Traversal - Inorder, Preorder, Postorder, Level order traversal.

Module III Graphs and Hashing **15 Hours**

Graphs: Weighted and Directed graphs - Adjacency matrix and list implementation - Traversal – Breadth First Search & Depth First Search. **Hashing:** Direct Address Table, Hash function, Collision resolution techniques, Linear Probing, quadratic probing, double hashing.

Total Hours (Theory):	**45**

Lab Component

S. No.	Lab Exercises
1	Implementation of Singly, Doubly and Circular Linked List.
2	Implementation of Stack using Arrays.
3	Implementation of Stack using Linked List.
4	Implementation of Stack applications
5	Implementation of Queue using Arrays.
6	Implementation of Queue using Linked List.
7	Implementation of Queue applications.
8	Implementation of Hashing techniques
9	Implementation of Binary Search Tree.

10	Implementation of Graph Traversal algorithms	
	Total Hours (Lab):	**30 Hours**
	Total Hours: (45+30)	**75 Hours**
Text Books:		
1	Sartaj Sahni, “Data Structures, Algorithms and Applications in C++”, Silicon paper publications, 2004.	
2	Anany Levitin, Introduction to the design & analysis of algorithms, 3rd Edition, Pearson Education, 2021.	
3	Michael T. Goodrich, “Data Structures and Algorithms in C++”, 2nd Edition, Wiley Publication, 2011.	
Reference Books:		
1	Seymour Lipschutz,“Data Structures by Schaum Series”,2nd Edition, Tata McGraw Hill, 2013.	
2	Narasimha Karumanchi, “Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles”,5thEdition, CareerMonk,2016.	
3	Debasis Samanta, “Classic data structures”, Prentice Hall of India, 2nd Edition,2014.	
Web References:		
1	https://www.codingninjas.com/courses/c-plus-plus-data-structures-and-algorithms	
2	https://www.edx.org/course/data-structures-algorithms-using-c	
Online Resources:		
1	https://www.programiz.com/dsa l	
2	https://freevideolectures.com/course/2519/c-programming-and-data-structures	
3	https://www.cprogramming.com/algorithms-and-data-structures.html	

Continuous Assessment									**End Semester Practical 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]**
C201.1	Understand	Quiz	20
C201.2	Apply	Case Study	20
C201.3, C201.5	Analyse	Group Assignment	20
C201.4	Apply	Assignment	20

Assessment based on Summative Assessment - Theory		
Bloom's Level	**Summative Assessment (15%) [120 Marks]**	
	CIA1: (60 Marks)	**CIA2: (60 Marks)**
Remember	20	20
Understand	40	30
Apply	40	40
Analyse	-	10
Evaluate	-	-
Create	-	-

Assessment based on Continuous Assessment - Practical			
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**		**End Semester Practical Examination (50%) [100 Marks]**
	FA: (75 Marks)	**SA: (25 Marks)**	
Remember	10	10	10
Understand	30	30	30
Apply	60	40	40
Analyse	-	20	20
Evaluate		-	-
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									1	3	1	1
C201.2	3	3	3	3	3				2	1		2	3	2	2
C201.3	3	3	3	3	3				2	1		2	3	2	2
C201.4	3	3	3	3	3				2	1		2	3	2	2
C201.5	3	3	3	3	3				2	1		2	3	2	2
C201	**3**	**3**	**3**	**3**	**3**				**2**	**1**		**2**	**3**	**2**	**2**

3	Strongly agreed	2	Moderately agreed	1	Reasonably agreed

23CD201	**DATABASE MANAGEMENT SYSTEMS**	**1/0/4/3**
Nature of Course:	D (Theory Application)	
Prerequisites:	Nil	

Course Objectives:

1	To describe information and data models and relational databases.
2	To explain an Entity Relationship Diagram and design a relational database for a specific use case.
3	To implement different relational model constraints.
4	To manage database using SQL commands

Course Outcomes:

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

C201.1	Conceptualize data using the relational model.	[U]
C201.2	Improve the database design through normalization.	[U]
C201.3	Manipulate a database using SQL.	[AP]
C201.4	Implement advanced SQL concepts on database.	[AP]
C201.5	Infer the transactions management in a database environment.	[A]

Course Contents:

MODULE I INTRODUCTION **15 Hours**

Introduction to DBMS, Characteristics of DBMS, DBMS vs File Systems, need for DBMS, Three Level DBMS Architecture, Data Models – Introduction, Benefits, and Phases, ER Diagrams – Symbols, Components, Relationships, Weak entities, Attributes, Cardinality, Relational Algebra, Domain Relational Calculus, Tuple Relational Calculus, Normalization - 1NF, 2NF, 3NF, BCNF, 4NF

MODULE II CONSTRAINTS AND SQL COMMANDS **15 Hours**

DDL Commands - Create, Drop, Alter, Truncate, Rename, Keys - primary Key, Foreign Key DML Commands - Select, Insert, Update, Delete, Any, All, In, Exists, Non Exists, Union, Intersection, Subqueries - nested, correlated, Joins- Inner, Outer, and Equi, Functions - SUM, COUNT, AVG, MIN, MAX, Clauses - Group By, Having By, Embedded SQL, Dynamic SQL, Transaction Concepts – Transaction model – ACID Properties – Serializability –Transactions as SQL statements.

MODULE III QUERIES AND TRANSACTIONS **15 Hours**

Creation and Dropping of Views, Creation and Execution of Stored Procedures Cursors and Triggers - Opening, Fetching and Closing, Creation , Insertion, Deletion and Updating Database Applications: Payroll Processing Systems, Railway Reservation Systems, Bank Management System Introduction, Storage media and file structures, B+ Tree Hashing – static and Dynamic, Introduction to Query Processing – Issues in query optimization – Steps in query processing, Concurrency control and transactions, Lock based protocols Recovery System – Failure classification

Lab Experiments:

1. Conceptual Database design using E-R DIAGRAM
2. Implementation of SQL commands DDL, DML, DCL and TCL
3. Queries to demonstrate implementation of Integrity Constraints
4. Practice of Inbuilt functions
5. Implementation of Join and Nested Queries AND Set operators
6. Implementation of virtual tables using Views
7. Practice of Procedural extensions (Procedure, Function, Cursors, Triggers)
8. Mini Project (Application Development)
   i) IT Training Group Database
   ii) Blood Donation System
   iii) Salary Management System
   iv) Traffic Light Information System

Total Hours:	**45+30**

Text Books:	
1	Abraham Silberschatz, Henry F Korth, S Sudarshan, “Data base System Concepts”, 7th Edition, McGraw hill, 2020.
2	Vijay Krishna Pallaw, “Database Management Systems”, 2nd Edition Asian Books Private Limited, 2010.
3	Mark L. Gillenson, "Fundamentals of Database Systems", 7th Edition, Wiley India Pvt. Limited, 2008.
Reference Books:	
1	Raghu Ramakrishnan, Johannes Gehrke, Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw-Hill Education, 2017
2	C. Date, "SQL and Relational Theory", O'Reilly Media, Incorporated, 2011.
Web References:	
1	http://www.sqlcourse.com/
2	https://www.w3schools.com/sql/
3	https://www.geeksforgeeks.org/dbms/
Online Resources:	
1	https://www.coursera.org/learn/database-management
2	https://www.udemy.com/database-management-system/
3	https://onlinecourses.swayam2.ac.in/cec22_cs18/preview

Continuous Assessment									End Semester Practical 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]**
C201.1	Understand	Quiz	**20**
C201.2		Assignment	**20**
C201.3, C201.4	Apply	Group Assignment	**20**
C201.5	Analyse	Case Study	**20**

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	40	30
Apply	50	40
Analyse	-	20
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	20	10	10
Understand	20	20	20
Apply	40	40	40
Analyse	20	30	30
Evaluate	-	-	-
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	1			1					1		1	2		1
C201.2	3	3	3	3					2	2		3	3	2	2
C201.3	3	3	2	1					2	1	2	3	3	2	2
C201.4	3	3	2	2	2				2	1	2	2	3	2	2
C201.5	3	2	2		2				1	2	2	3	2	2	2

23CY201	OBJECT ORIENTED PROGRAMMING USING JAVA	1/0/4/3
Nature of Course	F (Theory Programming)	
Pre requisites	Java Programming	

Course Objectives:

1	To provide insight knowledge of OOP concepts and usage of this, static, super and final keywords.
2	To discuss about different type of Collection Frameworks.
3	To demonstrate threads, JDBC & exception handling with real world examples.
4	To illustrate designing of GUI applications using swing component.

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

C201.1	Illustrate the OOPs concepts like Constructors, Inheritance, Polymorphism and the usage of this, static, super and final keywords.	[AP]
C201.2	Apply the concepts of Exception Handling in real world applications and usage of collection frameworks.	[AP]
C201.3	Develop Multithreaded applications.	[AP]
C201.4	Develop GUI Applications using swing component and to explain the concept of Servlets.	[AP]
C201.5	Develop java application to interact with database by using relevant JDBC Driver.	[AP]

Course Contents:

Module I Introduction to OOPS 15 Hours

Class and Object, Encapsulation and Abstraction, Inheritance, Polymorphism, Message Passing, Keywords : this, super, static, final, extends and implements. Method Signature and Prototype, Mutator Methods and Accessor Methods, Var-Arg Method, hashCode() and toString() methods. Immutable Objects Vs Mutable Objects, User defined Immutable Class, Constructors : Introduction, Default Constructor, User Defined Constructors, Constructor Overloading, Instance Variable, Instance Methods, Instance Block and Instance Flow Of Execution. Regular Expressions (RegEx).

Inheritance Introduction, Types of Inheritance, Up Casting, Down Casting, IS-A Relationship & HAS-A Relationship, Composition Vs Aggregation, **Polymorphism:** Method Overloading, & Method Overriding.

Module II Abstraction, Exception Handling & Collections 15 Hours

Abstraction: Abstract Methods and Abstract classes. Interfaces, abstract classes and Interfaces, Concrete Methods Vs Abstract Methods, Differences between classes, abstract classes and Interfaces, Marker Interfaces

Exception - try catch block, Finally Block, Exception Hierarchy, Multiple Exceptions In a Catch Block, Parameterized Try Block, Overriding Methods And Exception. Creating Your Own Exception, The Assert Keyword, The Generics Framework, **Collections:** Set, List, Map & Tree, The Iterator Interface. Working with Hash table Collection **Threads:** Introduction to Threads, Creating And Starting Threads, Basic Thread Control Methods. Multithreading, Working with Multiple, threads, Thread Life Cycle, Thread Priorities, Synchronizing Methods.

Module III Swings, Servlets & JDBC 15 Hours

Swings: Introduction, JLabel, JButton, JTextField ,JTextArea, JPasswordField, JCheckbox, JComboBox, JRadioButton, JScrollBar, JMenuItem and JMenu.

JDBC: Drivers, CURD operations, Database connectivity
Servlets : Overview of Servlets , Servlet Life Cycle, Servlet Request and Response , web.xml and its need, Servlet Configuration, Session Tracking

Total Hours	**45 Hours**

List of Experiments

1. Implementation of default and parameterized constructors.

2.	Implementation of method overloading and overriding.
3.	Implementation of Inheritance.
4.	Implementation of Abstract and Interface concepts.
5.	Programs using collection Interface.
6.	Implementation of multithreading Concepts.
7.	Program to handle multiple exception using try, catch and finally block.
8.	Implementation of swing components.
9.	Implement Simple application using servlets.
10.	Implement CURD operation using JDBC.
	Total Hours 30 Hours
Text Books:	
1.	Herbert Schildt,"Java:TheCompleteReference",12th edition, Mc craw Hill, 2021.
2.	Robert Liguori, Patricia Liguori, "Java 8 Pocket Guide", O'Reilly Media, 2014.
3.	ShagunBakliwal, Hands-on Application Development using Spring Boot, bpb publisher, 2021.
Reference Books:	
1.	Paul Deitel, Harvey Deitel, "Java How To Program",10th Edition, Prentice Hall Publications,2014.
2.	Cay S.Horstmann and GaryCornell, "Core Java, Vol.2: Advanced Features", 9th Edition, Prentice Hall,2013.
Web References:	
1	https://www.javatpoint.com/java-tutorial
2	https://www.geeksforgeeks.org/java/
3	http://www.javatpoint.com/java-tutorial
Online Resources:	
1	http://www.coursera.org/specializations/object-oriented-programming
2	http://www.udemy.com/topic/java-certification/
3	http://www.edx.org/learn/jav

Continuous Assessment									**End Semester Practical 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]**
C201.1 & C201.3	Apply	Quiz	20
C201.2	Apply	Assignment	20
C201.4 & C201.5	Apply	Case Study	40

Assessment based on Summative Assessment – Theory		
Bloom's Level	**Summative Assessment (15%) [120 Marks]**	
	CIA1: (60 Marks)	**CIA2: (60 Marks)**
Remember	20	20
Understand	40	40
Apply	40	40
Analyse	-	-
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	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 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 Outcomes (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	3	1					2	2		2	3	2	3
C201.2	3	3	3	3	2				3	2		2	3	2	2
C201.3	3	3	3	2	3				2	2		2	3	3	3
C201.4	3	3	3	2	3				2	2		2	3	3	3
C201.5	3	3	3	2	3				2	2		2	3	3	3

23CY202	OPERATING SYSTEMS	3/0/2/4
Nature of Course:	F (Theory Programming)	
Pre requisites:	Nil	

Course Objectives:

1	To identify the structure and functions of Operating System.
2	To describe the OS mechanisms to handle processes and threads.
3	To experiment CPU scheduling policies, synchronization techniques and deadlock handling in real time problems.
4	To articulate Memory management schemes.
5	To discuss Device Management, I/O and File systems concepts.

Course Outcomes

Upon completion of the course, students shall have ability to

C202.1	Review the basic concepts and functions of operating systems.	[U]
C202.2	Interpret the processes and threads in operating systems for real world problems.	[U]
C202.3	Examine CPU scheduling algorithms, process synchronization mechanisms and deadlock handling methods.	[AP]
C202.4	Practice memory management techniques including virtual memory and page replacement algorithms.	[AP]
C202.5	Illustrate the concepts related to mass storage, I/O and file system.	[AP]

Course Contents:

MODULE I Introduction **15 Hours**

Defining Operating Systems - User view - System view - Computer-System organization - Computer System Architecture - Operating System Operations - Resource Management - Virtualization - Computing Environments - OS Services - System Calls - Overview of Operating System Specific applications - OS Structures - System Boot. Process: Concept - Scheduling – Operations. Thread: Overview - Multicore Programming - Multithreading Models.

MODULE II Process & Memory Management **15 Hours**

CPU Scheduling - Process Synchronization: Synchronization Tools - Classic Problems of Synchronization – Deadlocks: System Model- Deadlock in Multithreaded Applications - Deadlock Characterization - Methods for Handling Deadlocks - Prevention - Avoidance -Detection – Recovery. Main memory: Background - Contiguous Memory Allocation – Paging - Structure of the Page Table – Swapping. Virtual memory - Background - Demand Paging - Copy-on-Write - Page Replacement - Allocation of Frames - Thrashing - Memory Compression.

MODULE III File Management, I/O and storage **15 Hours**

File-System Interface: File concept - Access methods-Directory Structure - Protection. File System Implementation: File System Structure- Directory implementation- Allocation Methods- Free Space Management. File system Internals: File Systems - File System mounting - Partitions and Mounting - File Sharing. I/O Systems: Overview - I/O Hardware. Mass Storage Structure: Overview - HDD Scheduling - NVM Scheduling - Storage Device Management - Storage Attachment. Case Study: NAND flash storage system, IPC in windows.

Total Hours:	**45 Hours**

Laboratory Component:

S. No	List of Experiments
1.	Study of Basic Linux Commands, proc file system of linux, disk I/O, buffer caches, disk monitoring tool
2.	Implementation of Shell Programming
3.	Implementation of Unix System Calls
4.	Implementation of Non Pre emptive and Pre emptive CPU Scheduling Algorithms
5.	Implementation of Dining Philosopher's Problem to demonstrate Process Synchronization
6.	Implementation of Banker's Algorithm for Deadlock Avoidance
7.	Implementation of Memory Allocation and Management Techniques
8.	Implementation of Page Replacement Techniques
9.	Implementation of File organization Techniques and study on modern file systems like ZFS, btrfs, ext4 etc.
10.	Implementation of Disk Scheduling Algorithms. Compare CPU and Disk Scheduling algorithms in terms of the number of voluntary and involuntary context switches.

Total Hours:	**30 Hours**

Text Books:

1.	Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts" 10th Edition, John Wiley, 2018
2.	D.M Dhamdhere, "Operating Systems"- A Concept based Approach, 3rdEdition, McGraw Hill,2017

Reference Books:

1.	Andrew S. Tanenbaum, Modern Operating Systems 5thEdition, Pearson Education, 2016.
2.	William Stallings, "Operating Systems – Internals and Design Principles", 8thEdition, Pearson Publications, 2014.

Web References:

1.	https://www.studocu.com/sg/course/nanyang-technological-university/operating-systems/1390534
2.	https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/
3.	https://www.gatevidyalay.com/operating-system/

Online Resources:

1.	https://www.coursera.org/learn/os-power-user
2.	https://nptel.ac.in/courses/106108101

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]**
C202.1	Understand	Quiz	20
C202.2	Understand	Assignment	20
C202.3 & C202.4	Apply	Tutorial	20
C202.5	Apply	Case Study	20

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	20
Understand	40	30	40
Apply	40	50	40
Analyse	-	-	-
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	40	20	30
Apply	40	60	50
Analyse	-	-	-
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
C202.1	2	2	2						2	1		2	2	2	2
C202.2	3	3	3	2	2				2	1		3	3	2	2
C202.3	3	3	3	3	3				2	1		3	3	2	2
C202.4	3	3	3	3	3				2	1		3	3	2	2
C202.5	3	3	3						2	1		3	2	2	2
C202	**3**	**3**	**3**	**3**	**3**				**2**	**1**		**3**	**3**	**2**	**2**

3	Strongly agreed	2	Moderately agreed	1	Reasonably agreed

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) - ThirumalaiNayakarMahal - 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 KumizhiThoompu 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	தமிழகவரலாறு – மக்களும்பண்பாடும்–கே.கே.பிள்ளை(வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர்இல. சுந்தரம் . (விகடன்பிரசுரம்).
3	கீழடி – வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4	பொருநை – ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
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]**
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	-	-	-
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
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

23AS102	APPLIED SCIENCE LABORATORY (Common to B.E. CSD, CSE, CSE (CYBER SECURITY), ECE, EEE, MCT & B.Tech. AI&DS, IT	L/T/P/C 0/0/4/2

Nature of Course	: E (Skill based)
Pre requisites	: Basic Applied Science laboratory skills

Course Objectives:

1.	To carry out experiments to understand the basic laws of magnetism.
2.	To Understand of how objects become electrically charged and how electrical charge is transferred from one object to another.
3.	To understand the principles and applications of electrochemistry and learning electro-analytical methods, and explore the knowledge of various energy sources and storage devices.
4.	To understand the concepts of photo-physical and photochemical processes in spectroscopy.

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

C102.1	To determine the magnetic field around a current carrying conductor	[E]
C102.2	To determine the rate of growth or decay in a resistor -capacitor circuit and to estimate the resonant frequency and Q-factor.	[E]
C102.3	To determine the relationship between the magnetic flux density and the magnetizing field strength and to find the specific resistance of the wire.	[E]
C102.4	To determine the pH, single electrode potential using reference electrodes and Electroplating process based on electrolytic cell.	[E]
C102.5	Interpret the principle and working of Spectroscopic technique.	[E]

Lab Components:

1	Determination of Magnetic field along the axis of current carrying coil-Stewart and Gee method.	[E]
2	Determination of characteristics of RC circuit to find the time constant.	[E]
3	Determination of characteristics of LCR circuits.	[E]
4	Determination of Hysteresis loss.	[E]
5	Determine the Specific resistance- Carey fosters bridge	[E]
6	Determination of strength of strong acid by pH metry.	[E]
7	Estimation of dissolved oxygen in waste water using Winkler's method.	[E]
8	Determination of single electrode potential of Zinc and Copper by Potentiometric method.	[E]
9	Determination of cathode efficiency of Nickel using electroplating process.	[E]
10	Spectrophotometry-Estimation of iron in sample water.	[E]
	Total Hours:	**30**

Text Book:

1	Anoop Sing Yadav "Applied Physics Lab Manual" Vayu Education of India Publisher, 2018.
2	Sesha Sai Kumar Vemula, Manual for Experiments in Engineering Physics, LAP LAMBERT Academic Publishing 2017
3	C. S. Robinson, Dr. Ruby Das, "A text book of Engineering practical physics", Laxmi Publications Pvt. Ltd., 2016.
4	S.L.Gupta and V Kumar "Practical Physics Volume -II", Pragati Prakashan ., 2023.

5	Method of Sampling and Test (Physical and Chemical) for Water and Wastewater-Iron, 2003, Part-53; First Revision.
6	Method of Sampling and Test (Physical and Chemical) for Water and Wastewater: pH Value (2001; Part-50; Coagulation Test).
7	Method of Sampling and Test (Physical and Chemical) for Water and Wastewater, Chemical Oxygen Demand, 2012, Part-58.
8	Science and Technology Laboratory Manual. E-Book. NIOS, 2012.
References:	
1	Dr. Ruby Das and Prashant Kumar Sahu,A Textbook of Engineering Physics Practical , 2016,2nd Edition
2	S. L. Gupta and Dr. V. Kumar, "Practical physics with viva voice", Pragati Prakashan Publishers, Revised Edition, 2009.
3	M. N. Avadhanulu, A. A. Dani and Pokely P.M, "Experiments in Engineering Physics", S. Chand&Co,2008.
4	Sawyer, C. N., McCarty, P. L., and Parkin, G. F. 2017. Chemistry for Environmental Engineering. Fifth Edition, McGraw-Hill, Inc., New York.
5	American Public Health Association et al, Standard Methods for the Examinations of Water and Waste Water, APHA. 2017.
6	AWWA, WEF, APHA, 2017, Standard Methods for the Examination of Water and Wastewater (Method: 5210B, BOD).
Web References:	
1	https://vlab.amrita.edu/
2	https://bop-iitk.vlabs.ac.in/basics-of-physics/
3	http://vlabs.iitb.ac.in/
4	https://www.iitg.ac.in/
5	https://ee1-nitk.vlabs.ac.in/exp/determination-of-ph/simulation.html
6	https://ee1-nitk.vlabs.ac.in/exp/determination-of-biological-oxygen/simulation.html
7	https://www.youtube.com/watch?v=pORJQyP-2j8
8	https://ee1-nitk.vlabs.ac.in/exp/determination-of-ph/simulation.html
9	https://ee1-nitk.vlabs.ac.in/exp/determination-of-ph/simulation.html

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
75	**25**	**100**	**60**	**40**	**100**

Assessment based on Continuous and End Semester Examination			
Bloom's Level	**Continuous Assessment (60%) [100 Marks]**		**End Semester Practical Examination (40%) [100 Marks]**
	FA (75 Marks)	**SA (25 Marks)**	
Remember	0	0	0
Understand	10	10	10
Apply	30	30	30
Analyze	30	30	30
Evaluate	30	30	30
Create	0	0	0

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C102.1	3	2	1	2					2			1	1		
C102.2	3	2	1	2					2			1	1		
C102.3	3	2	1	2					2			1	1		
C102.4	3	2	1	2					2			1	1		
C102.5	3	2	1	2					2			1	1		

	3	Strongly agreed	2	Moderately agreed	1	Reasonably agreed