

SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.E-Computer Science and Engineering

CURRICULUM and SYLLABI

[For students admitted in 2021-2022]

B.E / B.Tech Regulation 2019

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem

(An Autonomous Institution)

Courses of Study for B.E/B. Tech. Semester I under Regulations 2019 (CBCS)

Branch: Computer Science and Engineering

S.No	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
Theory								
1	U19ENG101B	English for Engineers– I	1	0	2	2	HS	45 (15L+30P)
2	U19MAT102A	Linear Algebra and Calculus	3	1	0	4	BS	60
3	U19PHY103B	Engineering Physics	3	0	0	3	BS	45
4	U19CHE104B	Applied Chemistry -I	3	0	0	3	BS	45
5	U19PPR105	Problem Solving Using Python Programming	3	0	0	3	ES	45
6	U19BEE106A	Basic Electrical and Electronics Engineering	3	0	0	3	ES	45
Practical								
7	U19PCL108B	Physics and Chemistry Laboratory	0	0	2	1	BS	30
8	U19BEEL113A	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	ES	30
9	U19PPL111	Python Programming Laboratory	0	0	2	1	ES	30
10	U19GE101	Basic Aptitude -I	0	0	2	0	EEC	30
Total Credits							21	
Optional Language Elective*								
11	U19OLE1101	French	0	0	2	1	HS	30
12	U19OLE1102	German						30
13	U19OLE1103	Japanese						30

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Computer Science and Engineering BoS	Member Secretary, Academic Council	Chairperson, Academic Council & Principal
Dr. M. Renuga	Dr. B. Sathiyabhama	Dr. R. Shivakumar	Dr. S. R. R. Senthil Kumar

Copy to:-HOD/ Computer Science and Engineering, First Semester BE CSE Students and Staff, COE

Sona College of Technology, Salem – 636 005
(An Autonomous Institution)

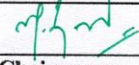

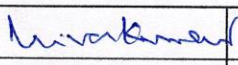

Courses of Study for BE / B Tech Semester II under Regulations 2019 (CBCS)

Branch: Computer Science and Engineering

S.No	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
Theory								
1	U19ENG201B	English for Engineers-II	1	0	2	2	HSMC	45 (15L+30P)
2	U19MAT202B	Discrete Mathematics	3	1	0	4	BSC	60
3	U19PHY203A	Material Science	2	0	0	2	BSC	30
4	U19CHE204A	Applied Chemistry -II	2	0	0	2	BSC	30
5	U19CS201	Programming in C	3	0	0	3	ESC	45
6	U19EGR206A	Engineering Graphics	2	0	2	3	ESC	60 (30L+30P)
Practical								
7	U19WPL212	Workshop Practice	0	0	2	1	ESC	30
8	U19CS202	C Programming Laboratory	0	0	2	1	ESC	30
9	U19GE201	Basic Aptitude - II	0	0	2	0	EEC	30
Total Credits						18		
Optional Language Elective*								
10	U19OLE1201	French	0	0	2	1	HSMC	30
11	U19OLE1202	German						
12	U19OLE1203	Japanese						

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

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Dr. M. Renuga	Dr. B. Sathiyabhama	Dr. R. Shivakumar	Dr. S. R. R. Senthil Kumar

Copy to: -HOD/ Computer Science and Engineering, Second Semester BE CSE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2019
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hour
Theory							
1	U19MAT301B	Probability and Statistics	3	1	0	4	60
2	U19CS301	Data Structures	3	0	0	3	45
3	U19CS302	Computer Architecture	3	0	0	3	45
4	U19CS303	Computer and Information Ethics	3	0	0	3	45
5	U19CS304	Object Oriented Programming	3	0	0	3	45
6	U19EC306	Communication Systems	3	0	0	3	45
7	U19GE302	Mandatory Course : Environment and Climate Science	2	0	0	0	30
Practical							
8	U19CS305	Data Structures Laboratory	0	0	4	2	60
9	U19CS306	Object Oriented Programming Laboratory	0	0	4	2	60
10	U19GE301	Soft Skills and Aptitude- I	0	0	2	1	30
Total Credits						24	

Approved By

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Dr.B.Sathiyabhama

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Third Semester BE CSE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV Regulations 2019
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19MAT401A	Numerical and Regression Analysis	3	1	0	4	60
2	U19CS401	Operating Systems	3	0	0	3	45
3	U19CS402	Database Management Systems	3	0	0	3	45
4	U19CS403	Design and Analysis of Algorithms	3	0	0	3	45
5	U19GE405	Principles of Management	3	0	0	3	45
6	U19GE403	Mandatory course: Essence of Indian Traditional Knowledge	2	0	0	0	30
Practical							
7	U19CS404	Operating Systems Laboratory	0	0	4	2	60
8	U19CS405	Database Management Systems Laboratory	0	0	4	2	60
9	U19GE401	Soft Skills and Aptitude -II	0	0	2	1	30
Total Credits						21	

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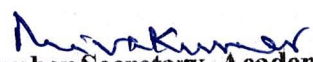
HOD/Computer Science and Engineering, Fourth Semester BE CSE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V Regulations 2019
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19CS501	Computer Networks	3	0	0	3	45
2	U19CS502	Software Engineering	3	0	0	3	45
3	U19CS503	Theory of Computation	3	0	0	3	45
4	U19EC509	Embedded System Design	3	0	0	3	45
5	noc23-cs91	NPTEL : Software Testing	3	0	0	3	45
6	U19CS901	Professional Elective : Software Project Management	3	0	0	3	45
	U19CS902	Professional Elective : Agile Methodologies					
Practical							
7	U19CS504	Computer Networks Laboratory	0	0	4	2	60
8	U19CS505	Software Development Laboratory	0	0	2	1	30
9	U19GE501	Soft Skills and Aptitude III	0	0	2	1	30
Total Credits						22	

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Dr.R.Shivakumar


Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Fifth Semester BE CSE Students and Staff, COE

CSE
2019

CSE
VI

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI under Regulations 2019 (CBCS)
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact hours
Theory							
1	U19CS601	Principles of Compiler Design	3	0	0	3	45
2	U19CS602	Full Stack Development	2	0	2	3	60
3	U19CS603	Artificial Intelligence	3	0	0	3	45
4	U19CS909	Professional Elective Machine Learning	3	0	0	3	45
	U19CS913	Professional Elective Business Intelligence					
	U19CS908	Professional Elective Bigdata Analytics					
5	U19CS918	Professional Elective Cloud Computing	3	0	0	3	45
	U19CS921	Professional Elective Green Computing					
Open Elective							
6	U19BM1001	Hospital Management	3	0	0	3	45
	U19CE1002	Municipal Solid Waste Management					
	U19CE1003	Energy Efficiency and Green Building					
	U19EC1006	Mobile Technology and Its Applications					
	U19EE1002	Energy Conservation and Management					
	U19MC1004	Fundamentals of Robotics					
	U19ME1004	Renewable Energy Sources					
	U19ME1002	Industrial Safety					
	U19FT1002	Garment Manufacturing Technology					
	U19EE1003	Innovation, IPR and Entrepreneurship Development					
	U19EE1004	Renewable Energy Systems					
U19FT1001	Fundamentals of Fashion Design						
Practical							
7	U19CS604	Compiler Design Laboratory	0	0	4	2	60
8	U19CS605	Artificial Intelligence Laboratory	0	0	4	2	60
9	U19GE601	Soft Skills and Aptitude – IV	0	0	2	1	30
Total Credits						23	

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Dr.B.Sathiyabhama

Member Secretary, Academic Council

Dr.R.Shivakumar

Chairperson, Academic Council & Principal

Dr.S.R.R.Senthil Kumar

Copy to:- HOD/Computer Science and Engineering, Sixth Semester BE CSE Students and Staff, COE

Sona College of Technology, Salem-5

List of Professional Electives B.E/B.Tech under Regulation 2019

Department of Computer Science and Engineering

S.No	Course Code	Course Name	L	T	P	C
1.	U19CS901	Software ProjectManagement	3	0	0	3
2.	U19CS902	Agile Methodologies	3	0	0	3
3.	U19CS903	Parallel and DistributedAlgorithms	3	0	0	3
4.	U19CS904	Graph Theory	3	0	0	3
5.	U19CS905	Software Design and Architecture	3	0	0	3
6.	U19CS906	Software Testing	3	0	0	3
7.	U19CS907	Software Agents	3	0	0	3
8.	U19CS908	Big DataAnalytics	3	0	0	3
9.	U19CS909	MachineLearning	3	0	0	3
10.	U19CS910	Knowledge Engineering	3	0	0	3
11.	U19CS911	DatabaseTuning	3	0	0	3
12.	U19CS912	Information Retrieval	3	0	0	3
13.	U19CS913	Business Intelligence	3	0	0	3
14.	U19CS914	Data Warehousingand Data mining	3	0	0	3
15.	U19CS915	DistributedSystems	3	0	0	3
16.	U19CS916	Digital ImageProcessing	3	0	0	3
17.	U19CS917	Mobile Computing	3	0	0	3
18.	U19CS918	Cloud Computing	3	0	0	3
19.	U19CS919	Wireless Sensor Networks	3	0	0	3
20.	U19CS920	Quantum Computing	3	0	0	3
21.	U19CS921	Green Computing	3	0	0	3
22.	U19CS922	Deep Learning	3	0	0	3
23.	U19CS923	Human Computer Interaction	3	0	0	3
24.	U19CS924	ComputerGraphics	3	0	0	3
25.	U19CS925	Web Development	3	0	0	3
26.	U19CS926	Multimediasystems	3	0	0	3
27.	U19CS927	Mobile Application Development	3	0	0	3
28.	U19CS928	Advanced JavaProgramming	3	0	0	3
29.	U19CS929	Augmented Reality and Virtual Reality	3	0	0	3
30.	U19CS930	Security inComputing	3	0	0	3
31.	U19CS931	SoftwareDefined Networks	3	0	0	3
32.	U19CS932	Bio Informatics	3	0	0	3
33.	U19CS933	Cyber Forensics	3	0	0	3
34.	U19CS934	Cyber Lawand Ethics	3	0	0	3
35.	U19CS935	Ethical Hacking	3	0	0	3

SONA COLLEGE OF TECHNOLOGY, SALEM-5

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LIST OF PROFESSIONAL ELECTIVES FOR HONOURS DEGREE

Date: 12.05.2023

S.No	Vertical 1: Data Science	Vertical 2: Full Stack Development	Vertical 3: Cloud Computing And Data Center Technologies	Vertical 4: Cyber Security And Data Privacy	Vertical 5: Software Engineering
1.	Exploratory Data Analysis	Web Development	Cloud Computing	Digital and Mobile Forensics	Software Project Management
2.	Recommender Systems	Mobile Application Development	Virtualization	Social Network Security	Software Testing
3.	Neural Networks	Cloud Services Management	Cloud Services Management	Security in Computing	Agile Methodologies
4.	Information Retrieval	DevOps	Storage Technologies	Cyber Forensics	Software Quality Assurance
5.	Text and Speech Analysis	Game Development	Data Warehousing and Data mining	Cyber Law and Ethics	Software Architecture
6.	Business Intelligence	Web3	Software Defined Networks	Cyber Security in Health Care	Software Agents
7.	Image and Video Analytics	Metaverse	Cloud Security	Cloud Security	Secure Coding
8.	Supply Chain Management	Secure Coding	Edge Computing	Risk Management	Software Design patents
9.	Knowledge Engineering		Docker Essentials	Threat Intelligence	Software Documentation

Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee

SONA COLLEGE OF TECHNOLOGY, SALEM-5

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LIST OF PROFESSIONAL ELECTIVES FOR HONOURS DEGREE

Date: 12.05.2023

S.No	Vertical 6: Blockchain Technologies	Vertical 7: Creative Media	Vertical 8: Data Analytics
1.	Introduction to Blockchain Technologies	Visual Effects	Knowledge Engineering
2.	FinTech	Metaverse	Image and Video Analytics
3.	Bitcoin and Cryptocurrency Technologies	Animation	HealthCare Analytics
4.	Web3 and Blockchain	Digital Marketing	Bio Inspired Computations
5.	Blockchain Application Development using Python	Video Creation and Editing	Business Intelligence
6.	Ethereum and Solidity	UI and UX Design	Text and Speech Analysis
7.	Smart Contract and HyperLedger	Short Film Development	Social Media Analytics
8.	Supply Chain Management	Digital Audio and Video Design	Information Retrieval
9.		Motion Graphics	
10.		3D Printing and Design	

Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee

SONA COLLEGE OF TECHNOLOGY, SALEM-5

Department of Computer Science and Engineering

Honours Degree- Verticals & Courses

(Offered to UG students admitted during AY 2021- 2022 onwards, Regulation 2019)

Vertical 1: DATA SCIENCE

S.No	Course Code	Course Name	L	T	P	C
1	U19CS2001	Exploratory Data Analysis	3	0	0	3
2	U19CS2002	Recommender Systems	3	0	0	3
3	U19CS2003	Neural Networks	3	0	0	3
4	U19CS912	Information Retrieval	3	0	0	3
5	U19CS2004	Text and Speech Analysis	3	0	0	3
6	U19CS913	Business Intelligence	3	0	0	3
7	U19CS2005	Image and Video Analytics	3	0	0	3
8	U19CS2006	Supply Chain Management	3	0	0	3
9	U19CS910	Knowledge Engineering	3	0	0	3
Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee						

Vertical 2: FULL STACK DEVELOPMENT

S.No	Course Code	Course Name	L	T	P	C
1	U19CS925	Web Development	3	0	0	3
2	U19CS927	Mobile Application Development	3	0	0	3
3	U19CS2007	Cloud Services Management	3	0	0	3
4	U19CS2008	DevOps	3	0	0	3
5	U19CS2009	Game Development	3	0	2	4
6	U19CS2010	Web3	3	0	0	3
7	U19CS2011	Metaverse	3	0	0	3
8	U19CS2012	Secure Coding	3	0	0	3
Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee						

Vertical 3: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES

S.No	Course Code	Course Name	L	T	P	C
1	U19CS918	Cloud Computing	3	0	0	3
2	U19CS2013	Virtualization	3	0	0	3
3	U19CS2007	Cloud Services Management	3	0	0	3
4	U19CS2014	Storage Technologies	3	0	0	3
5	U19CS914	Data Warehousing and Data mining	3	0	0	3
6	U19CS931	Software Defined Networks	3	0	0	3
7	U19CS2015	Cloud Security	3	0	0	3
8	U19CS2016	Edge Computing	3	0	0	3
	U19CS2017	Docker Essentials	3	0	0	3
Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee						

Vertical 4: CYBER SECURITY AND DATA PRIVACY

S.No	Course Code	Course Name	L	T	P	C
1	U19CS2018	Digital and Mobile Forensics	3	0	0	3
2	U19CS2019	Social Network Security	3	0	0	3
3	U19CS930	Security in Computing	3	0	0	3
4	U19CS933	Cyber Forensics	3	0	0	3
5	U19CS934	Cyber Law and Ethics	3	0	0	3
6	U19CS2020	Cyber Security in Health Care	3	0	0	3
7	U19CS2015	Cloud Security	3	0	0	3
8	U19CS2021	Risk Management	3	0	0	3
9	U19CS2022	Threat Intelligence	3	0	0	3
Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee						

Vertical 5: SOFTWARE ENGINEERING

S.No	Course Code	Course Name	L	T	P	C
1	U19CS901	Software Project Management	3	0	0	3
2	U19CS906	Software Testing	3	0	0	3
3	U19CS902	Agile Methodologies	3	0	0	3
4	U19CS2023	Software Quality Assurance	3	0	0	3
5	U19CS2024	Software Architecture	3	0	0	3
6	U19CS907	Software Agents	3	0	0	3
7	U19CS2012	Secure Coding	3	0	0	3
8	U19CS2025	Software Design patents	3	0	0	3
9	U19CS2026	Software Documentation	3	0	0	3
Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee						

Vertical 6: BLOCKCHAIN TECHNOLOGIES

S.No	Course Code	Course Name	L	T	P	C
1	U19CS2027	Introduction to Blockchain Technologies	3	0	0	3
2	U19CS2028	FinTech	3	0	0	3
3	U19CS2029	Bitcoin and Cryptocurrency Technologies	3	0	0	3
4	U19CS2030	Web3 and Blockchain	3	0	0	3
5	U19CS2031	Blockchain Application Development using Python	3	0	0	3
6	U19CS2032	Ethereum and Solidity	3	0	0	3
7	U19CS2033	Smart Contract and HyperLedger	3	0	0	3
8	U19CS2006	Supply Chain Management	3	0	0	3

Vertical 7: CREATIVE MEDIA

S.No	Course Code	Course Name	L	T	P	C
1	U19CS2035	Visual Effects	3	0	2	4
2	U19CS2011	Metaverse	3	0	0	3
3	U19CS2036	Animation	3	0	0	3
4	U19CS2037	Digital Marketing	3	0	0	3
5	U19CS2038	Video Creation and Editing	3	0	0	3
6	U19CS2039	UI and UX Design	3	0	2	4
7	U19CS2040	Short Film Development	3	0	2	4
8	U19CS2041	Digital Audio and Video Design	3	0	0	3
9	U19CS2042	Motion Graphics	3	0	2	4
10	U19CS2043	3D Printing and Design	3	0	0	3
Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee						

Vertical 8: DATA ANALYTICS

S.No	Course Code	Course Name	L	T	P	C
1	U19CS910	Knowledge Engineering	3	0	0	3
2	U19CS2005	Image and Video Analytics	3	0	0	3
3	U19CS2044	HealthCare Analytics	3	0	0	3
4	U19CS2045	Bio Inspired Computations	3	0	0	3
5	U19CS913	Business Intelligence	3	0	0	3
6	U19CS2004	Text and Speech Analysis	3	0	0	3
7	U19CS2046	Social Media Analytics	3	0	0	3
8	U19CS912	Information Retrieval	3	0	0	3
Maximum of two SWAYAM Courses in specific vertical identified by Department Consultative Committee						

SONA COLLEGE OF TECHNOLOGY, SALEM-5

Department of Computer Science and Engineering

Minor Degree- Verticals & Courses

(Offered to UG students admitted during AY 2021- 2022 onwards, Regulation 2019)

Minor Vertical : CYBER SECURITY

S.No	Course Code	Course Name	L	T	P	C
1	U19CS2047	Data Communications & Networking	3	0	0	3
2	U19CS2048	Cryptography	3	0	0	3
3	U19CS935	Ethical Hacking	3	0	0	3
4	U19CS2049	Digital Forensics	3	0	0	3
5	U19CS2019	Social Network Security	3	0	0	3
6	U19CS2050	Security in IOT and Cloud	3	0	0	3
7	U19CS2051	Security Information and Event Management	3	0	0	3
8	U19CS934	Cyber Law and Ethics	3	0	0	3
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Branch: Computer Science and Engineering

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Theory								
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2	U19MAT102A	Linear Algebra and Calculus	3	1	0	4	BS	60
3	U19PHY103B	Engineering Physics	3	0	0	3	BS	45
4	U19CHE104B	Applied Chemistry -I	3	0	0	3	BS	45
5	U19PPR105	Problem Solving Using Python Programming	3	0	0	3	ES	45
6	U19BEE106A	Basic Electrical and Electronics Engineering	3	0	0	3	ES	45
Practical								
7	U19PCL108B	Physics and Chemistry Laboratory	0	0	2	1	BS	30
8	U19BEEL113A	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	ES	30
9	U19PPL111	Python Programming Laboratory	0	0	2	1	ES	30
10	U19GE101	Basic Aptitude -I	0	0	2	0	EEC	30
Total Credits							21	
Optional Language Elective*								
11	U19OLE1101	French	0	0	2	1	HS	30
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**U19ENG101B - ENGLISH FOR ENGINEERS – I
COMMON TO CSE, ECE, EEE, MCT, BME**

**L T P C
1 0 2 2**

Course Outcomes: At the end of course, the students will be able to

1. Use grammatical components effectively in both written and spoken communication
2. Develop speaking skills for self-introduction, delivering speeches and technical presentation.
3. Speak effectively in real time and business situations
4. Write email, formal letters and descriptions of graphics
5. Develop skills for writing reports and proposals, and for general purpose and technical writing.

S.No	Course outcomes	Programme outcomes												Pso1	Pso2
		1	2	3	4	5	6	7	8	9	10	11	12		
1	Frame sentences correctly with accuracy	2	1	1	1	1	2	3	2	2	3	3	3	3	3
2	Write emails and formal letters	3	2	2	3	3	3	3	2	3	3	3	3	3	3
3	Speak effectively in real time and business situations	3	3	2	3	3	3	3	2	3	3	3	3	3	3
4	Write email, formal letters and descriptions of graphics	1	1	1	2	2	1	2	2	1	3	1	1	1	1
5	Develop skills for writing reports and proposals, and for general purpose and technical writing.	2	1	1	3	2	2	3	3	3	3	2	3	3	3

UNIT I

- General Vocabulary, Parts of speech
- Self-introduction – personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town.
- Instructions, Email – fixing an appointment, cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Paragraph writing – Describing – defining – providing examples or evidences

UNIT II

- Tenses, active and passive voice
- Welcome address, vote of thanks, special address on specific topic.
- Checklists, letter writing – business communication, quotations, placing orders, complaints, replies to queries from business customers, inviting dignitaries, accepting and declining invitations

UNIT III

- Prefixes and Suffixes
- Mini presentation in small groups of two or three, on office arrangements, facilities, office functions, sales, purchases, training recruitment, advertising, applying for financial assistance, applying for a job, team work, discussion, presentation.
- Job application letter and resume, recommendations,

UNIT IV

- Modal verbs and probability, concord
- Situational Role Play - between examiner and candidate, teacher and student, customer and sales manager, hotel manager and organiser, team leader and team member, bank manager and candidate, interviewer and applicant, car driver and client, industrialist and candidate, receptionist and appointment seeker, new employee and manager, employee and employee, p.a. and manager, schedule for training
- Note making, Proposal

UNIT V

- If conditionals
- Situational Role Play - Asking for directions, seeking help with office equipment, clarifying an error in the bill, job details, buying a product, selling a product, designing a website, cancelling and fixing appointments, hotel accommodation, training facilities, dress code, conference facilities.
- Memo, technical report writing, feasibility reports, accident report, survey report

TOTAL: 45 Hours

Speaking test will be conducted for 20 marks externally and evaluated along with English for Engineers – I in the End Semester Valuation.

TEXT BOOK:

- Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

Extensive Reading

- The Story of Amazon.com- Sara Gilbert, published by Jaico
- The Story of Google – Sara Gilbert, published by Jaico

Reference

- Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
- A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

U19MAT102A - LINEAR ALGEBRA AND CALCULUS
Common to CIVIL, MECH, EEE, CSE, IT and MCT

L T P C
3 1 0 4

COURSE OUTCOMES

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

1. find the rank of the matrix and solve linear system of equations by direct and indirect methods
2. apply the concepts of vector spaces and linear transformations in real world applications
3. apply the concepts of eigen values and eigen vectors of a real matrix and their properties in diagonalization and the reduction of a real symmetric matrix from quadratic form to canonical form
4. find the Taylor's series expansion, Jacobians and the maxima and minima of functions of two variables
5. apply appropriate techniques of multiple integrals to find the area and volume.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2							2	2	
CO2	3	3	2	3	2							2	2	
CO3	3	3	2	3	2							2	2	
CO4	3	3	2	3	2							2	2	
CO5	3	3	2	3	2							2	2	

UNIT – I LINEAR SYSTEM OF EQUATIONS 12

Rank of a matrix – Solution of linear system of equations by matrix method, Gauss elimination, Gauss-Jordan, Gauss-Jacobi and Gauss-Seidel methods.

UNIT – II VECTOR SPACES 12

Vector Space – Linear independence and dependence of vectors – Basis – Dimension – Linear transformations (maps) – Matrix associated with a linear map – Range and kernel of a linear map – Rank-nullity theorem (without proof).

UNIT – III EIGEN VALUES AND EIGEN VECTORS 12

Eigen values and eigen vectors of real matrices – Properties of eigen values and eigen vectors – Cayley-Hamilton theorem – Diagonalization of real symmetric matrices – Reduction of quadratic form to canonical form.

UNIT – IV MULTIVARIABLE CALCULUS**12**

Functions of several variables – Partial differentiation – Total derivative – Jacobians – Taylor's theorem for function of two variables – Maxima and minima of function of two variables without constraints – Constrained maxima and minima by Lagrange's method of undetermined multipliers.

UNIT – V MULTIPLE INTEGRALS**12**

Double integrals – Change of order of integration – Change of variables from Cartesian to polar coordinates – Area as double integrals in Cartesian coordinates – Triple integrals – Volume as triple integrals in Cartesian coordinates.

Theory: **45 Hours**Tutorial: **15 Hours**Total: **60 Hours****TEXT BOOKS:**

1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCE BOOKS:

1. S. Lipschutz and M. L. Lipson, "Linear Algebra", McGraw Hill Publishers, 6th Edition, 2018.
2. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
3. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.

U19PHY103B - ENGINEERING PHYSICS
(For B.E Computer Science and Engineering)

L T P C
3 0 0 3

Course Outcomes: At the end of the course, the students will be able to,

- CO1 :** Discuss the dual nature of matter and radiation and the application of wave nature of particles.
- CO2 :** Describe the basic components of lasers.
- CO3 :** Analyse the relation between arrangement of atoms and material properties.
- CO4 :** Deduce Maxwell’s equations using the fundamentals of electromagnetism.
- CO5 :** Elucidate the different modes of heat transfer.

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs, PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO – 1	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 2	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 3	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 4	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 5	3	2	-	-	-	-	-	-	-	-	2	2	-	3

UNIT I - QUANTUM PHYSICS

9

Origin of quantum mechanics – Limitations of classical theory - Dual nature of matter and radiation.

Particle nature of radiation - Compton effect - Explanation based on quantum theory - Expression for Compton shift (no derivation).

Wave nature of matter - de Broglie waves - Schrödinger’s time independent and time dependent wave equations - Physical significance of wave function - Energy and wave function of an electron trapped in one dimensional box.

Application of wave nature of particles - Electron microscope - Comparison of optical and electron microscope - Scanning electron microscope - Limitations of electron microscope.

UNIT II - LASERS

9

Basic terms - Energy level - normal population - induced absorption (pumping) - population inversion - meta stable state - spontaneous emission - stimulated emission.

Basic components of a laser - Active medium - pumping technique - optical resonator
Einstein’s theory - stimulated absorption - spontaneous emission and stimulated emission.

Types of lasers - Solid lasers (Nd:YAG) - Gas lasers (CO₂ laser) - semiconductor laser (homojunction and hetero junction laser)

Holography - Construction and reconstruction of hologram.

UNIT III - CRYSTAL PHYSICS

9

Importance of crystals - Types of crystals - Basic definitions in crystallography (Lattice –space lattice - unit cell - lattice parameters – basis - crystallographic formula) - Seven crystal systems and fourteen Bravais lattices – Lattice planes and Miller indices – Interplanar distance - d spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number and Atomic Packing factor for SC, BCC, FCC and HCP Structures - Polymorphism and allotropy.

Crystal imperfections - Point, line and surface defects - burger vector.

UNIT IV – ELECTROMAGNETISM

9

Electrostatics - Electric field - Electric field intensity – Field due to discrete and continuous charges – Electric lines of forces – Electric flux – Gauss’s law – Divergence of E – Applications of Gauss’s law – Curl of E.

Magnetostatics – Magnetic fields – Magnetic Lorentz force – Force experienced by current carrying conductor in magnetic field – Steady currents – Magnetic field due to steady current - Biot - Savart Law - Straight line currents – Ampere’s circuital law – Divergence and curl of B – Applications of Ampere’s circuital law - Comparison of Magneto statics and Electrostatics.

UNIT V - THERMAL PHYSICS

9

Heat and temperature - Modes of heat transfer (Conduction, convection and radiation) - Specific heat capacity - thermal capacity and coefficient of linear thermal expansion. **Thermal conductivity** - Measurement of thermal conductivity of good conductor - Forbe’s method - Measurement of thermal conductivity of bad conductor - Lee’s disc method - Radial flow of heat - Cylindrical flow of heat - Practical applications of conduction of heat.

Thermal radiations - Properties of thermal radiations - Applications of thermal radiations.

TOTAL: 45 Hours

TEXT BOOKS

- M.N.Avadhanulu, 'Engineering Physics' S.Chand & Company Ltd, New Delhi (2015)
- D. K. Bhattacharya, Poonam Tandon "Engineering Physics" Oxford University Press 2017.

REFERENCES

- Engineering Physics, Sonaversity, Sona College of Technology, Salem (Revised Edition 2018).
- B. K. Pandey and S. Chaturvedi, Engineering Physics , Cengage Learning India Pvt. Ltd., Delhi, 2019
- Rajendran, V, and Marikani A, 'Materials science' TMH Publications, (2004) New Delhi.
- Palanisamy P.K, 'Materials science', SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)

U19CHE104B - APPLIED CHEMISTRY- I

L T P C
3 0 0 3

Course Outcomes: At the end of the course, the students will be able to

- CO1:** Outline the principles and applications of electrochemistry to engineering and technology.
- CO2:** Discuss the principle, applications of surface chemistry and catalysis in engineering and technology.
- CO3:** Analyze the types of corrosion and describe the methods of corrosion control.
- CO4:** Describe the basics of nano chemistry, synthesis, properties and applications of nano materials in engineering and technology.
- CO5:** Analyze the types of polymers, methods of polymerization and methods of fabrication.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3	2												2
CO-2	3	2												2
CO-3	3	2												2
CO-4	3	2												2
CO-5	3	2												2

UNIT I - ELECTROCHEMISTRY

9

Conductivity of Electrolytes – Kohlrausch’s Law of Independent Migration of Ions and Its Applications – Conductometric Titration (Acid-Base – HCl vs NaOH) – Electrode Potential – Nernst Equation – Derivation and Problems Based on Single Electrode Potential Calculation – Electrochemical Series – Significance – Reference Electrodes - Standard Hydrogen Electrode, Saturated Calomel electrode – Ion selective electrode - glass electrode - determination of pH for unknown solution – Electrochemical Cell – Emf of an Electrochemical Cell – Redox Reactions - Potentiometric Titrations (Redox – Fe^{2+} Vs Dichromate).

UNIT II - CORROSION AND ITS CONTROL

9

Dry or Chemical Corrosion - Pilling-Bedworth Rule – Wet or Electrochemical Corrosion – Mechanism of Electrochemical Corrosion – Galvanic Corrosion – Differential aeration Corrosion - Factors Influencing Corrosion – Corrosion Control - Cathodic Protection - Sacrificial Anodic Protection Method and Impressed Current Cathodic Protection – Protective Coatings – Metallic Coatings – Galvanizing process – Tinning process - Organic Coatings – Paints - Constituents and Functions.

UNIT III - SURFACE CHEMISTRY AND CATALYSIS

9

Adsorption – types - Physical and chemical adsorption – adsorption of gases on solids - Adsorption isotherms - Freundlich and Langmuir isotherms - Adsorption of solutes from solution – Applications of adsorption - Role of adsorption in catalytic reactions – Adsorption in pollution abatement (granular activated carbon and powdered activated carbon) – Catalysis - Types - Characteristics of catalysts - Autocatalysis - Definition and examples – catalytic promoters – catalytic poisons.

UNIT IV - NANOCHEMISTRY

9

Basics - Distinction between molecules, nanoparticles and bulk materials – Size-dependent properties – Nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire – Synthesis: Precipitation – Thermolysis – Hydrothermal – Solvothermal – Electrodeposition - Chemical vapour deposition - Sol-gel technique – Properties and applications of nano materials.

UNIT V - POLYMERS AND COMPOSITES

9

Nomenclature of Polymers – Functionality – Types of Polymerization-Addition-Condensation and Copolymerization – Classification of Polymers – Free Radical mechanism of Addition Polymerization – Properties of Polymers - Glass transition temperature – Tacticity - Methods of Polymerization – Bulk, solution, emulsion and suspension – Thermoplastic and Thermosetting Resins – Plastics – Moulding Constituents of Plastic – Moulding of Plastics into Articles-Injection - Compression and Blow Moulding – Composites - Constituents of Composites – Types of FRP Composites.

TOTAL : 45 Hours

TEXT BOOKS

- P. C. Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi, 2010 (15th Edition).
- G. Shanthy *et al.*, “Applied Chemistry”, Sonaversity, Sona College of Technology, Salem, 2019.

REFERENCE BOOKS

- H. K. Chopra, A. Parmer, “Chemistry for Engineers”, Narosa Publishing House, New Delhi, 110 002, 2016.
- Kannan P., Ravikrishnan A., “Engineering Chemistry”, Sri Krishna Hi-tech Publishing Company Pvt. Ltd., Chennai, 2009.
- B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2008.
- Ozin G. A. and Arsenault A. C., “Nanotechnology: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.

U19PPR105 - PROBLEM SOLVING USING PYTHON PROGRAMMING

L T P C
3 0 0 3

Course Outcomes: At the end of course, the students will be able to

- Develop algorithmic solutions to simple computational problems
- Write simple Python programs
- Write programs with the various control statements and handling strings in Python
- Develop Python programs using functions and files
- Analyze a problem and use appropriate data structures to solve it.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	1	2	2	1	3	2	3	3
CO2	3	3	3	3	3	2	1	1	1	1	1	3	1	3	3
CO3	3	3	3	3	3	3	2	1	1	1	1	3	1	3	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	1	3	2	3	3

UNIT I - ALGORITHMIC PROBLEM SOLVING

9

Need for computer languages, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

UNIT II - BASICS OF PYTHON PROGRAMMING

9

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

UNIT III - CONTROL STATEMENTS AND STRINGS

9

Conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration-while, for, infinite loop, break, continue, pass, else. Strings-String slices, immutability, string methods and operations.

UNIT IV - FUNCTIONS AND FILES

9

Functions - Introduction, inbuilt functions, user defined functions, passing parameters - positional arguments, default arguments, keyword arguments, return values, local scope, global scope and recursion. Files -Text files, reading and writing files.

UNIT V - DATA STRUCTURES: LISTS, SETS, TUPLES, DICTIONARIES 9

Lists-creating lists, list operations, list methods, mutability list functions, searching and sorting, Sets-creating sets, set operations. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries.

TOTAL: 45 Hours

TEXT BOOKS

- Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 2018.
- Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)

REFERENCES

- Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 2018.
- Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
- Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
- Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013.

U19BEE106A - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L T P C
3 0 0 3

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

- Analyse the various DC circuits and find the circuit parameters.
- Describe the principles of AC fundamentals.
- Discuss the construction and working principle of DC machines and Transformer.
- Explain the basics of semiconductor devices and its applications.
- Discuss the various applications of operational amplifier and working principle of UPS.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1	2	1	-	2	2	2	2	1	1
CO2	2	2	1	1	1	2	1	-	2	2	2	2	1	1
CO3	2	2	1	1	1	2	1	-	2	2	2	2	1	1
CO4	2	2	1	1	1	2	1	-	2	2	2	2	1	1
CO5	2	2	1	1	1	2	1	-	2	2	2	2	1	1

UNIT I - DC FUNDAMENTALS

9

Electrical components and parameters – Resistance, Conductance – Ohm’s law, limitations of Ohm’s law – Kirchhoff’s law – Power – Energy – resistors in series and parallel – comparison of series and parallel circuits – Star-Delta transformation – simple problems.

UNIT II - AC FUNDAMENTALS

9

AC waveforms – standard terminologies – RMS and average value of Sinusoidal, Triangular and Square waveforms – form factor, peak factor – Resistance, Inductance, Capacitance in AC circuits – Impedance – RL, RC, RLC series circuits – series resonance – simple problems.

UNIT III - ELECTRICAL MACHINES

9

DC Generator: construction of DC Machine – working principle of DC Generator – EMF equation – Types of DC Generator.

DC Motor: Working principle of DC Motor – Types of DC Motor.

Transformer: Working principle of Transformer – EMF equation – Transformation ratio.

UNIT IV - SEMICONDUCTOR DEVICES

9

BJT: Operations of NPN and PNP Transistors – Characteristics of Transistors in CE, CB and CC configuration.

Introduction to power semiconductors - SCR, MOSFET – V-I characteristics and applications.

UNIT V - OPERATIONAL AMPLIFIERS AND POWER SUPPLY

9

Operational Amplifier: Ideal characteristics of Op-Amp – Inverting amplifier, Non-Inverting amplifier – voltage follower – summing amplifier.

Rectifiers: working principle of half wave rectifier, full wave rectifier, bridge rectifier.

UPS: components of UPS – working principle of UPS.

TOTAL: 45 Hours

TEXT BOOKS

1. B.L. Theraja, “Fundamentals of Electrical Engineering & Electronics”, S. Chand & Co Ltd, 2015.
2. Muthusubramanian R, Salivahanan S, “Basic Electrical and Electronics Engineering”, 3rd Edition 2007, Tata McGraw-Hill publishing company limited.

REFERENCES

1. Mehta V.K, Rohit Mehta, “Principles of Electrical Engineering & Electronics”, S.Chand& Co. Ltd., 2011.
2. S.K. Bhattacharya, “Electrical Machines”, Tata MC Graw Hill Publishing company ltd., III edition, 2009.
3. Smarajit Ghosh, “Fundamentals of Electrical and Electronics Engineering”, II revised edition 2010, PHI publications.
4. D. Roy Choudhury and Shail Jain, “Linear Integrated Circuits”, First edition, New age international, 2011.
5. S. Padma, “Basic Electrical and Electronics Engineering”, Sonaversity, Revised edition 2016.

U19PCL108B - PHYSICS AND CHEMISTRY LABORATORY
PHYSICS PART

(For Computer Science and Engineering)

L T P C
0 0 2 1

Course Outcomes: At the end of the course, the students will be able to,

CO1: Apply the principles of Optics, Thermal Physics, Electricity and Elasticity to determine the Engineering properties of materials.

CO2: Identify hardness and suggest the quality of water suitable for domestic purpose and analyze the concentration of carbonate, bicarbonate and hydroxide present in the given sample of water.

CO3: Determine the resistivity of the given copper turn used for house hold applications and determine the amount of pH of house hold water sample and suggest the remedial measures.

Pre-requisite: Capable of using Screw guage, Vernier calliper, Travelling microscope, Spectrometer, able to handle burette and pipette

CO/PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			1		1					1			2
CO2	3			1		1					1			2
CO3	3			1		1					1			2

LIST OF EXPERIMENTS (PHYSICS PART)

1. Determination of velocity of ultrasonic waves and compressibility of the given liquid using ultrasonic interferometer.
2. Determination of dispersive power of the prism for various pairs of colors in the mercury spectrum using a spectrometer.
3. Determination of laser wavelength, particle size of lycopodium powder, acceptance angle and numerical aperture of an optical fibre using diode laser.
4. Determination of specific resistance of a given wire using Carey Foster's bridge.
5. Determination of the thermal conductivity of a bad conductor using Lee's Disc apparatus.
6. Determination of band gap of the given semiconductor diode.

(Any five experiments may be conducted from the above list)

List of Experiments (CHEMISTRY PART)

1. Estimation of hardness of water sample by EDTA method.
2. Estimation of alkalinity of water sample by indicator method.
3. Estimation of HCl by pH metry.
4. Estimation of HCl by conductometry. (HCl vs NaOH)
5. Estimation of ferrous ion by potentiometric titration.
6. Evaluate the iron content of the water by spectrophotometry.
(Any five experiments may be conducted from the above list)

Total: 30 Hours

U19BEEL113A - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

L T P C
0 0 2 1

Course Outcomes: At the end of course, the students will be able to

- Apply the basic circuit laws for calculating various parameters of DC and AC circuits
- Design the circuit for various applications using electronic devices.
- Analysis the performance characteristics of electronic devices such as SCR, MOSFET, BJT and op-amp.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	1	1	1	2	2	2	2	1	1
CO2	2	2	2	2	2	1	1	1	2	2	2	2	1	1
CO3	2	2	2	2	2	1	1	1	2	2	2	2	1	1

LIST OF EXPERIMENTS

1. Verification of Ohm's Law.
2. Verification of Kirchhoff's Law.
3. Measurement of power and power factor for RLC circuit.
4. Frequency response of RLC resonance circuit.
5. V-I characteristics of BJT in CB configuration.
6. V-I characteristics of BJT in CE configuration.
7. V-I characteristics of BJT in CC configuration.
8. V-I characteristics of MOSFET.
9. V-I characteristics of SCR.
10. Characteristics of operational amplifier as inverting and non-inverting amplifiers.
11. Measurement of ripple factor for half wave and full wave rectifier circuits.

TOTAL: 30 Hours

U19PPL111 - PYTHON PROGRAMMING LABORATORY

L T P C
0 0 2 1

Course Outcomes: At the end of course, the students will be able to

1. Implement the algorithms using basic control structures in Python
2. Develop Python programs to use functions, strings and data structures to solve different types of problems
3. Implement persistent storing information through file operations

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	0	1	2	2	1	2	3	3	3
CO2	3	3	3	3	2	2	0	1	2	2	1	2	3	3	3
CO3	3	3	3	3	2	2	0	1	2	2	1	3	3	3	3

LIST OF EXPERIMENTS

1. Draw flowchart using any open source software.
2. Implement programs with simple language features.
3. Implement various branching statements in python.
4. Implement various looping statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, indexing.
6. Implement user defined functions using python.
7. Implement recursion using python.
8. Develop python programs to perform operations on list and tuples
9. Implement dictionary and set in python
10. Implement python program to perform file operations.

TOTAL: 30 Hours

U19GE101 - BASIC APTITUDE – I
(Common to All Departments)

L T P C
0 0 2 0

Course Outcomes: At the end of course, the students will be able to

CO1: Solve fundamental problems in specific areas of quantitative aptitude

CO2: Solve basic problems in stated areas of logical reasoning

CO3: Demonstrate rudimentary verbal aptitude skills in English with regard to specific topics

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	2	2	1	3	3	3	3	1	1	3	2	2
CO 2	3	3	1	1	2	3	2	3	3	2	2	3	3	3
CO 3	1	2	1	2	1	1	1	3	3	3	1	3	3	3

1. Quantitative Aptitude and Logical Reasoning

Solving simple problems with reference to the following topics:

- Numbers – HCF & LCM
- Decimal fractions
- Square roots & cube roots
- Surds & Indices
- Logarithms
- Percentage
- Averages
- Coding and Decoding & Visual language

2. Verbal Aptitude

Demonstrating plain English language skills with reference to the following topics:

- Synonyms
- Antonyms
- Verbal analogy
- Editing passages
- Sentence filler words

TOTAL: 24 hours

Sona College of Technology, Salem – 636 005
(An Autonomous Institution)

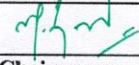

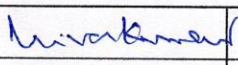

Courses of Study for BE / B Tech Semester II under Regulations 2019 (CBCS)

Branch: Computer Science and Engineering

S.No	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
Theory								
1	U19ENG201B	English for Engineers-II	1	0	2	2	HSMC	45 (15L+30P)
2	U19MAT202B	Discrete Mathematics	3	1	0	4	BSC	60
3	U19PHY203A	Material Science	2	0	0	2	BSC	30
4	U19CHE204A	Applied Chemistry -II	2	0	0	2	BSC	30
5	U19CS201	Programming in C	3	0	0	3	ESC	45
6	U19EGR206A	Engineering Graphics	2	0	2	3	ESC	60 (30L+30P)
Practical								
7	U19WPL212	Workshop Practice	0	0	2	1	ESC	30
8	U19CS202	C Programming Laboratory	0	0	2	1	ESC	30
9	U19GE201	Basic Aptitude - II	0	0	2	0	EEC	30
Total Credits						18		
Optional Language Elective*								
10	U19OLE1201	French	0	0	2	1	HSMC	30
11	U19OLE1202	German						
12	U19OLE1203	Japanese						

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

			
Chairperson, Science and Humanities BoS	Chairperson, Computer Science and Engineering BoS	Member Secretary, Academic Council	Chairperson, Academic Council & Principal
Dr. M. Renuga	Dr. B. Sathiyabhama	Dr. R. Shivakumar	Dr. S. R. R. Senthil Kumar

Copy to: -HOD/ Computer Science and Engineering, Second Semester BE CSE Students and Staff, COE

U19ENG201B- English for Engineers – II

First year II semester

CSE

Course Outcome: At the end of course, the students will be able to

1. Frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.
2. Develop and demonstrate listening skills for academic and professional purposes.
3. Draw conclusions on explicit and implicit oral information.
4. Develop effective reading skills and reinforce language skills required for using grammar and building vocabulary.
5. Read for gathering and understanding information, following directions and giving responses.

	COURSE OUTCOMES	PROGRAMME OUTCOMES												Pso 1	Pso 2
		1	2	3	4	5	6	7	8	9	10	11	12		
1	Frame sentences correctly, both in written and spoken forms of language with accuracy and fluency	2	1	2	3	2	3	3	3	3	3	3	3	3	3
2	Develop and demonstrate listening skills for academic and professional purposes	2	2	2	3	2	3	3	3	3	3	3	3	3	3
3	Draw conclusions on explicit and implicit oral information	3	2	2	3	2	3	3	3	3	3	3	3	3	3
4	Develop effective reading skills and reinforce language skills required for using grammar and building vocabulary	3	3	2	3	2	3	3	3	3	3	3	3	3	3
5	Read for gathering and understanding information, following directions and giving responses.	3	3	2	3	2	3	3	3	3	3	3	3	3	3

UNIT –I

- Cause and effect expressions, adjectives, comparative adjectives
- Listening to conversations, welcome speeches, lectures and description of equipment
- Listening to different kinds of interviews (face-to-face, radio, TV and telephone interviews)
- Understanding notices, messages, timetables, advertisements, graphs, etc.
- Reading passages for specific information transfer

UNIT – II

- Prepositions and dependent prepositions
- Understanding short conversations or monologues

- Taking down phone messages, orders, notes etc
- Listening for gist, identifying topic, context or function
- Reading documents for business and general contexts and interpreting graphical representations

UNIT – III

- Collocations
- Listening comprehension, entering information in tabular form
- Error correction, editing mistakes in grammar, vocabulary, spelling, etc.
- Reading passage with multiple choice questions, reading for gist and reading for specific information, skimming for comprehending the general idea and meaning and contents of the whole text

UNIT – IV

- Articles, adverbs
- Intensive listening exercises and completing the steps of a process.
- Listening exercises to categorise data in tables.
- Short reading passage: gap-filling exercise related to grammar, testing the understanding of prepositions, articles, auxiliary verbs, modal verbs, pronouns, relative pronouns and adverbs, short reading passage with multiple choice questions.

UNIT – V

- Pronouns
- Listening to extended speech for detail and inference
- Listening and developing hints
- gap-filling exercise testing the knowledge of vocabulary, collocations, dependent prepositions, grammatical structures
- Short reading passages for sentence matching exercises, picking out specific information in a short text

TOTAL: 45 hours

The listening test will be conducted for 20 marks and reading for 20 marks internally and evaluated along with English for Engineers – II in the End Semester Valuation.

Textbook:

Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

Extensive Reading

1. Who Moved my Cheese? – Spencer Johnson-G. P. Putnam's Sons
2. Discover the Diamond in You – Arindham Chaudhari – Vikas Publishing House Pvt. Ltd.

Reference

1. Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2. A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

B. E. / COMPUTER SCIENCE AND ENGINEERING

SEMESTER – II	DISCRETE MATHEMATICS	L	T	P	C
U19MAT202B		3	1	0	4

COURSE OUTCOMES

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

1. check the validity of the arguments in the field of data base and artificial intelligence using the rules of logic.
2. apply the concept of logical theory to validate the correctness of software specifications.
3. interpret and analyze the ordered structure using the concepts of relations and lattices.
4. produce an output for each input in computer programming and Turing machine.
5. apply the concepts of group theory in the field of coding theory and cryptography.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		3	2							2	2		2
CO2	3	3		3	2							2	2		2
CO3	3	3		3	2							2	2		2
CO4	3	3		3	2							2	2		2
CO5	3	3		3	2							2	2		2

UNIT – I PROPOSITIONAL CALCULUS

12

Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautology and contradiction – Contrapositive – Logical equivalences and implications – De Morgan's laws – Normal forms – Principal conjunctive and disjunctive normal form - Rules of inference – Arguments – Validity of arguments.

UNIT – II PREDICATE CALCULUS

12

Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications – Implications for quantified statements – Theory of inference – The rules of universal specification and generalization – Validity of arguments.

UNIT – III RELATIONS AND LATTICES

12

Relations - Types of relations and their properties – Equivalence relations – Partial order relation – Equivalence Classes – Partition of a set – Matrix representation of a relation – Representation of relations by graphs – Poset – Hasse diagram – Lattices and their properties.

UNIT – IV FUNCTIONS

12

Definition – Classification – Types of functions – Examples – Compositions of functions – Inverse functions – Characteristic function of a set – Permutation functions.

UNIT – V GROUPS AND GROUP CODES

12

Algebraic systems – Groups – Cyclic groups – Subgroups – Group homomorphism – Cosets – Lagrange's theorem – Normal subgroups – Rings (Definition and examples only) – Codes and group codes – Basic notions of error detection and error correction.

Theory: **45 Hours**

Tutorial: **15 Hours**

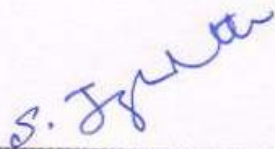
Total: **60 Hours**

TEXT BOOK:

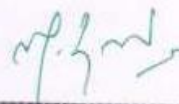
1. T. Veerarajan, "Discrete Mathematics", McGraw Hill Publishers, 1st Edition, 21st Reprint, 2015.

REFERENCE BOOKS:

1. J. P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill Publishers, 1st Edition, 2017.
2. K. H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill Publishers, 8th Edition, 2019.
3. B. Kolman, R. C. Busby and S. C. Ross, "Discrete Mathematical Structures", Pearson Publishers, 6th Edition, 2006.



Prof. S. JAYABHARATHI
Head / Department of Mathematics
Sona College of Technology
Salem – 636 005



Dr. M. RENUGA
BoS - Chairperson
Science and Humanities
Sona College of Technology
Salem – 636 005

10. 05. 2019

B. E. / B. Tech. Regulations 2019

Course Code: U19PHY203A L T P C
 Course Name: MATERIALS SCIENCE 2 0 0 2 100

(for Computer Science and Engineering)

COURSE OUTCOMES:

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

- CO1 Differentiate the electrical and thermal conductivity of metals.
- CO2 Elucidate the classification and theory of semiconducting materials.
- CO3 Distinguish the types of Magnetic materials.
- CO4 Explain the Optical data storage techniques.
- CO5 Discuss the novel properties of metallic glasses and nanomaterials.

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs, PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO – 1	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 2	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 3	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 4	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO - 5	3	2	-	-	-	-	-	-	-	-	2	2	-	3

Unit 1 Conducting materials **6**

Classical free electron theory of metals - Postulates of classical free electron theory - Electrical conductivity - definition and expression for electrical conductivity - thermal conductivity - definition and expression for thermal conductivity - Wiedemann - Franz law and Lorentz number.

Quantum free electron theory - Drawbacks of quantum free electron theory - origin of energy bands - Fermi energy and Fermi distribution function - Effect of temperature on Fermi function - Density of energy states - carrier concentration in metals.

Unit 2 Semiconducting Materials **6**

Intrinsic semiconductor - Energy band diagram of intrinsic semiconductors (at T= 0 K and T > 0 K) - Expression for number of electrons in conduction band - Expression for number of holes in valence

band (no derivation) - Law of mass action and intrinsic carrier concentration - Fermi level - Variation of Fermi level with temperature - electrical conductivity - band gap determination.

Extrinsic semiconductors - Draw backs of intrinsic semiconductors – Types of extrinsic semiconductors – ‘n’-type and ‘p’-type semiconductors – Energy band diagram of ‘n’ type and ‘p’ type semiconductors (at $T = 0\text{ K}$ and $T > 0\text{ K}$) – Carrier concentration of extrinsic semiconductors (Qualitative Treatment only) – Hall effect – Determination of Hall coefficient – Applications.

Unit 3 Magnetic materials

6

Basic definitions - Magnetic moment - Magnetic field - Magnetic field intensity - Magnetic permeability - Magnetization - Intensity of magnetization - Magnetic susceptibility.

Types of magnetic materials - Dia , Para , and Ferromagnetic materials - Domain theory and origin of domains – Anti ferromagnetic materials - Ferrimagnetic materials or Ferrites - Structure, properties and applications - hysteresis - Hard and soft magnetic materials.

Unit 4 Optoelectronic devices and Optical data storage techniques

6

Optoelectronic devices - LED - Organic LED - Polymer light emitting materials - Plasma light emitting devices - LCD - Laser diodes.

Optical data storage techniques - DVD - Blue ray disc - Holographic data storage.

Unit 5 New Engineering Materials:

6

Metallic glasses -Preparation, properties and applications.

Nanoscience and Nanotechnology - Significance of nanoscale - different types of nanostructures (0-D, 1-D, 2-D and 3-D) - Fabrication of nanomaterials - Ball milling and Chemical vapour deposition technique (CVD).

Carbon nanotubes - structure - properties and applications - fabrication - pulsed laser deposition method.

Lecture: 30, Tutorial: 00, Total: 30 Hours

Text Book:

1. M.N.Avadhanulu, ‘Engineering Physics’ S.Chand &Company Ltd, New Delhi (2015)
2. B. K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning India Pvt. Ltd., Delhi, 2012.

References:

1. Shanthi C, 'Physics of materials' Sonaversity , Sona College of Technology, Salem (Revised Edition 2016).
2. Rajendran, V, and Marikani A, 'Materials science' TMH Publications, (2004) New Delhi.
3. Palanisamy P.K, 'Materials science', SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)
4. M. Arumugam, 'Materials Science' Anuradha Publications, Kumbakonam, (2006).

COURSE CODE U19CHE204A
COURSE NAME APPLIED CHEMISTRY-II

L T P C
2 0 0 2

Course outcome:

At the end of the course the students will be able to

- CO1** Analyze the characteristics, conducting mechanism, synthesis and applications of conducting polymers.
- CO2** Describe the construction, working principle and applications of energy storage devices for electronic appliances.
- CO3** Discuss the principles, advantages and applications of organic electronic materials in electronic devices.
- CO4** Explain the electrochemical processes carried out in electronic industries.
- CO5** Outline the principles and applications of photochemistry and spectroscopy.

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO – 1	3	2												2
CO – 2	3	2												2
CO – 3	3	2												2
CO – 4	3	2												2
CO - 5	3	2												2

UNIT I CONDUCTING POLYMERS

6

Introduction – Structural characteristics and doping concept in metals and metal oxide nanoparticles - Charge carriers and conducting mechanism – Classification of conducting polymers: Intrinsic and extrinsic conducting polymers – Synthesis of conducting polymers - bulk and solution polymerization – Applications of conducting polymers in corrosion protection and sensors.

UNIT II MODERN ENERGY DEVICES FOR ELECTRONIC APPLIANCES

6

Reversible and Irreversible Cells – Batteries - Types of Batteries – Battery Characteristics-Voltage – Current – Capacity - Electricity Storage Density – Power - Discharge Rate -Cycle Life - Energy Efficiency and Shelf Life – Fabrication and Working of Alkaline Battery - Lead-Acid Battery - Ni-Cd - Lithium Ion Batteries and Solar cells – Hydrogen oxygen Fuel Cells.

UNIT III CHEMISTRY OF ORGANIC ELECTRONIC MATERIALS

6

Organic semiconducting materials – working principle and advantages over inorganic semiconducting materials - p-type and n-type organic semiconducting materials - Pentacene

Fullerenes-C-60 – Organic dielectric material – Definition - Working principle and examples - Polystyrene – PMMA – Organic Light Emitting Diodes (Oleds) – Construction - Working principle and applications – Organic transistors – Construction - Working principle and applications in electronic Industries.

UNIT IV ELECTROCHEMICAL PROCESSES IN ELECTRONIC INDUSTRIES

6

Electroplating – Principle and process - Plating parameters - Current and energy efficiency - Electroplating of nickel - Fundamentals of electroless deposition – Electroless plating of nickel - fabrication of PCB's - Electrochemical etching of copper from PCBs - Anodizing - Definition, principle and working methodology of aluminium anodizing - Chemical sensors - Optical and heat sensors – definitions and applications.

UNIT V PHOTOCHEMISTRY AND SPECTROSCOPY

6

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – Determination - Photo processes - Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitization. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. UV-Visible and IR spectroscopy – Principles, instrumentation (Block diagram only) and applications.

TOTAL: 30 HOURS

Text Books :

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi , 2010.
2. T. Maruthavanan et al., “Applied Chemistry-II”, Sonaversity, Sona College of Technology, Salem, 2019.

Reference Books :

1. B. Sivasankar, “Engineering Chemistry”, Tata McGraw-Hill Pub. Co. Ltd., New Delhi (2008).
2. Electroplating, Anodizing and Metal treatment”, Hand book, NIIR board, 2004.
3. Hagen Klauk, “Organic Electronics: Materials, Manufacturing and Applications”, Wiley-VCH, 2006.
4. Douglas A Skoog, Donald M West, James Holler F Stanley, R Crouch, “ Fundamentals Of Analytical Chemistry”, Thomson learning, 2006.

COURSE OUTCOMES:

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

1. Write simple C programs using console input and output functions
2. Write C programs using arrays, decision making and looping statements
3. Design and develop simple application using functions and pointers.
4. Design and develop real-time applications using structures and unions
5. Design and develop real-time applications using file operation

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	2	2	1	2	1	2	2	3	3	2	3
CO2	2	2	3	2	2	1	1	2	1	2	2	3	3	2	3
CO3	2	3	3	2	2	1	1	2	1	2	2	3	3	2	3
CO4	2	3	3	2	2	1	1	2	1	2	1	3	3	2	3
CO5	2	3	3	2	2	2	1	2	1	2	2	3	3	2	3

UNIT I C PROGRAMMING BASICS 9

Structure of a C program - C Character set, Identifiers and Keywords, Data Types, Declarations, Expressions, Statements and Symbolic constants, Operators – Arithmetic Operators – Unary operators – Relational and Logical Operators – Assignment operators – Conditional operators. Unformatted and formatted Input/Output functions, pre-processor directives and storage classes.

UNIT II CONTROL STATEMENTS, ARRAYS AND STRING 9

Conditional statements, Unconditional statements, branching and looping statements - Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations

UNIT III FUNCTIONS AND POINTERS 9

Function – Library functions and user-defined functions – Function prototypes and function definitions – Call by value – Call by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays – Pointers and Functions - Dynamic memory Allocation - Example Programs.

UNIT IV STRUCTURES AND UNIONS 9

Need for structure data type – structure definition – Structure declaration – Structure within a structure – Passing structures to functions – Array of structures – Pointers to structures – Union - Programs using structures and Unions

UNIT V FILE MANIPULATIONS 9

Files-File operations- Binary files and text files – Types of File processing-Sequential access - Random Access File - Command line arguments.

TOTAL: 45 Hours

TEXT BOOKS

1. Deitel and Deitel, “C How to Program”, Pearson Education, New Delhi, 2011.
2. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 14th edition, 2016.

REFERENCES

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.
2. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
4. E. Balagurusamy, “Programming in ANSI C”, seventh edition, Tata McGraw Hill, 2016.

U19EGR206A – ENGINEERING GRAPHICS

L T P C

2 0 2 3

- Course Outcomes: Upon completion of this course the students will be able to**
- CO1** Predict the construction of various curves in civil elevation, plan and machine components.
 - CO2** Analyze the principles of projection of various planes by different angle to project points, lines and planes.
 - CO3** Draw the principles of projection of simple solid by the axis is inclined to one reference plane by change of position method.
 - CO4** Understand the interior details of complex components, machineries by sectioning the solid body. Study the development of surfaces for prisms and pyramids.
 - CO5** Draw the projection of three dimensional objects representation of machine structure and explain standards of orthographic views by different methods.

CO / PO, PSO Mapping														
<small>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</small>														
Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	1	1	1	1	1	3	2	2	3	2	2
CO 2	3	2	2	1	2	1	1	1	3	2	2	3	2	2
CO 3	3	2	2	1	2	1	1	1	3	2	2	3	2	2
CO 4	3	2	2	1	2	1	1	1	3	2	2	3	2	2
CO 5	3	2	2	1	1	1	1	1	3	2	2	3	2	2

UNIT I – PLANE CURVES (Manual drafting) 06

Curves used in engineering practices Conics – Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II – PROJECTION OF POINTS, LINES AND PLANE SURFACES (CAD software) 12

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

UNIT III – PROJECTION OF SOLIDS (CAD software) 12

Creation of 3D CAD models of pyramids, prisms and solids of revolutions-Sectional views - **(Not for Examination)**

Projection of simple solids like prisms – pyramids – cylinder and cone when the axis is inclined to one reference plane by change of position method.

**UNIT IV – SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES
(CAD software) 12**

Sectioning of simple solids like prisms – pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids – Prisms – pyramids – cylinders and cones.

**UNIT V – Conversion of Isometric Views to Orthographic Views (Manual drafting)
12**

Representation of three dimensional objects – General Principles of Orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

TOTAL: 60 Hours

TEXT BOOKS

1. P. Suresh et al., “Engineering Graphics and Drawing”, Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.
2. K.V. Natarajan Engineering Graphics by, Chennai, 17th edition 2003.

REFERENCES

1. Dhananjay A. Jolhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.
2. Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. K. R. Gopalakrishnana, Engineering Drawing (Vol. I & II), Subhas Publications, 1998.
4. Bertoline & Wiebe fundamentals of graphics communication III edition McGrawhill 2002

U19WPL212 – WORKSHOP PRACTICE

L	T	P	C
0	0	2	1

Course Outcomes: At the end of the course, the students will be able to

CO1 familiarize with the basic of tools and equipment's used in fitting, carpentry, welding and sheet metal.

CO2 fabricate the different simple products in above trades.

CO3 produce different joining of metals.

List of Experiments SECTION 1:

FITTING

Tools and Equipment's- Practice in filling. Making of Vee joint and square (T-fitting) joint.

SECTION 2: SHEET METAL

Tools and Equipment's- Practice Making of Dust Pan and Funnel.

SECTION 3: WELDING

Tools and Equipment's – Practice
Arc welding of Butt joint and Lap Joint.

SECTION 4: CARPENTRY

Tools and Equipment's- Planning Practice Making of Half Lap joint and Dovetail Joint.

TOTAL: 30 Hours

COURSE OUTCOMES

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

1. Design and develop simple programs using branching, looping statements
2. Develop programs using functions, arrays, structures and string handling
3. Write programs using pointers, dynamic memory allocation and file handling

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1	1	1	1	2	1	3	3	2	3
CO2	2	3	3	3	2	1	1	1	1	2	1	3	3	2	3
CO3	2	3	3	3	2	1	3	3	3	3	3	3	3	2	3

LIST OF EXPERIMENTS

1. Programs using Input, Output and assignment statements.
2. Programs using Branching statements
3. Programs using Looping statements
4. Programs using Functions
5. Programs using Arrays
6. Programs using Structures
7. Programs using Strings
8. Programs using Pointers (both data pointers and function pointers)
9. Programs using dynamic memory allocation
10. Programs using Recursion
11. Programs using Files
12. Develop a Mini Project for real time application

TOTAL: 30 Hours

U19GE201 - BASIC APTITUDE - II

L	T	P	C
0	0	2	0

Course Outcomes: At the end of the course, the students will be able to CO1

solve more elaborate problems than those in BA-I in specific areas of

quantitative aptitude.

CO2 solve problems of greater intricacy than those in BA-I in stated areas of logical reasoning.

CO3 demonstrate higher than BA-I level verbal aptitude skills in English with regard to specific topics.

List of Experiments

1. QUANTITATIVE APTITUDE AND LOGICAL REASONING

Solving quantitative aptitude and logical reasoning problems with reference to the following topics:

- a. Ratio and proportion
- b. Partnership
- c. Chain rule
- d. Ages
- e. Profit, loss and discount
- f. Geometry
- g. Area and volume
- h. Data arrangement

2. VERBAL APTITUDE

Demonstrating verbal aptitude skills in English with reference to the following topics:

- a. Jumbled sentences
- b. Reconstructions of sentences (PQRS)
- c. Sentence fillers two words
- d. Idioms and phrases
- e. Spotting errors
- f. Writing captions for given pictures

TOTAL : 24 Hours

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2019
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hour
Theory							
1	U19MAT301B	Probability and Statistics	3	1	0	4	60
2	U19CS301	Data Structures	3	0	0	3	45
3	U19CS302	Computer Architecture	3	0	0	3	45
4	U19CS303	Computer and Information Ethics	3	0	0	3	45
5	U19CS304	Object Oriented Programming	3	0	0	3	45
6	U19EC306	Communication Systems	3	0	0	3	45
7	U19GE302	Mandatory Course : Environment and Climate Science	2	0	0	0	30
Practical							
8	U19CS305	Data Structures Laboratory	0	0	4	2	60
9	U19CS306	Object Oriented Programming Laboratory	0	0	4	2	60
10	U19GE301	Soft Skills and Aptitude- I	0	0	2	1	30
Total Credits						24	

Approved By

Chairperson, Computer Science and Engineering BoS
Dr.B.Sathiyabhama

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Third Semester BE CSE Students and Staff, COE

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching - Linear Search – Binary Search, Sorting – Bubble sort – Selection sort – Insertion sort – Merge sort, Hashing - Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 hours

TEXT BOOKS:

1. Mark Allen Weiss, “Data structures and Algorithm Analysis in C”, Pearson Education, New Delhi, Second Edition, 2012.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest , Clifford Stein, “Introduction to Algorithms” ,3rd Edition, MIT Press, 2010.
2. Jean Paul Tremblay and Sorenson, “An Introduction to Data Structures with Applications”, McGraw Hill Publishing Company, New Delhi, Second Edition, 2007.
3. Yedidyah Langsam, Moshe J Augenstein and Aaron M Tanenbaum, “Data Structures using C and C++”, Prentice Hall of India/ Pearson Education, New Delhi, 2006.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Silicon Press, New Jersey, Second Edition, 2005.

COURSE OUTCOMES:

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

- Demonstrate the operational concepts of computers and classify instruction set architectures
- Identify the mechanism of control signals generation in Hardwired control and micro programmed control unit
- Apply the various arithmetic operations and discuss the design of ALU
- Evaluate the performance of a pipelined processors
- Analyze the various performance measures for memory and IoT.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	COMPUTER ARCHITECTURE														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	1	2	2	2	2	3	3	3	2	2
CO2		3	3	3	1	1	3	2	3	3	2	1	3	2	2
CO3	2	3	3	3		2	2	1	3	1	2	2	2	2	2
CO4	2	3	3	3	3	1	1	2	3	1	2	3	3	2	2
CO5		2	3	2	2	1	1	1	2	2	2	2	2	2	2

UNIT I BASIC STRUCTURE OF COMPUTERS 9

Functional units – Basic operational concepts – Bus structures – Instructions and instruction sequencing – Hardware – Software Interface – Translation from a high level language to the Hardware language- Instruction set architecture – Styles and features-Addressing modes – RISC – CISC- Amdhal's law- Performance and metrics.

UNIT II BASIC PROCESSING UNIT 9

Components of the processor-Data path and control- Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control.

UNIT III ARITHMETIC FOR COMPUTERS 9

Signed and Unsigned number representations - Arithmetic operations: Addition and Subtraction – Fast Adders – Binary Multiplication – Booth algorithm-Binary Division – Floating Point Numbers – Representation and operations.

UNIT IV PIPELINING 9

Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets – Data path and control considerations – Performance considerations – Exception handling.

UNIT V MEMORY AND I/O**9**

Need for a hierarchical memory system – Types and characteristics of memories – Cache memories – Improving cache performance – Virtual memory – Memory management techniques - Accessing I/O devices – Programmed Input/Output – Interrupts – Direct Memory Access – Need for Standard I/O Interfaces like PCI, SCSI, USB.

TOTAL: 45 hours**TEXT BOOK:**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.

REFERENCES

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.
3. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 1998.
4. V.P. Heuring, H.F. Jordan, “Computer Systems Design and Architecture”, Second Edition, Pearson Education

COURSE OUTCOMES

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

- Analyze a problem and identify classes, objects and the relationships among them.
- Develop applications using various types of Inheritance and Interfaces.
- Develop applications or programs using polymorphism and multithreading.
- Analyze an application and make use of object oriented concepts for its implementation.
- Develop programs using collections, files and streams in java.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	OBJECT ORIENTED PROGRAMMING														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	1	2	2	3	3	3	3	2	2	3
CO2	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

UNIT I INTRODUCTION**7**

Introduction to OOP– Object Oriented Programming Concepts - Java Fundamentals - Characteristics of Java - Data Types, Variables, and Arrays - Operators-Control Statements – Classes – Methods – access specifiers – static members - Constructors- Garbage Collection.

UNIT II INHERITANCE INTERFACES AND EXCEPTION HANDLING**10**

Inheritance: Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces: Defining an interface, Implementing interface, differences between classes and interfaces and extending interfaces - Exception Handling Fundamentals – Java’s Built-in Exceptions-Creating new Exception subclasses.

UNIT III POLYMORPHISM AND MULTITHREADING IN JAVA**10**

Polymorphism- Abstract classes and methods-Overloading-Overriding-final methods and classes – Multithreaded programming –The Thread class and the Runnable Interface-Creating multiple threads-Synchronization.

UNIT IV STRING HANDLING AND COLLECTION FRAMEWORK**11**

String Constructors-String Operations-Generic classes and methods-The Collection Framework Collections-List-ArrayList, Linked List, Set-HashSet, Linked HashSet, Queue-PriorityQueue, Map-HashMap, SortedMap, TreeMap.

UNIT V FILES AND STREAMS IN JAVA

7

Files and streams –Byte Stream-I/O Stream, File I/O Stream, ByteArray I/O Stream-Character Stream-File Reader and Writer, CharArrayReader and Writer-Serialization.

TOTAL: 45 HOURS

TEXT BOOKS

1. Herbert Schildt, “Java the Complete Reference”, Ninth edition Tata Mc Graw Hills, 2014.
2. Cay S. Horstmann, Gary Cornell, —Core Java Volume –I Fundamentals, 9th Edition, Prentice Hall, 2013.

REFERENCES

1. Paul Deitel and Harvey Deitel, —”Java How to Program (Early Objects)”, Tenth Edition, Pearson Prentice Hall 2014.
2. Timothy Budd, —”An Introduction to Object-Oriented Programming”, Third Edition, Pearson Education, 2008.
3. E.Balaguruswamy, “Programming with Java”, Second Edition, TMH, 2009

COURSE OUTCOMES:

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

- Explain basics of communication systems and its working principles.
- Illustrate the generation and detection methods of various AM systems.
- Describe the transmission and demodulation methods of angle modulation systems
- Examine the fundamentals of analog and digital pulse modulation methods.
- Summarize the principles of spread spectrum methods, satellite and cellular mobile communication systems.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	COMMUNICATION SYSTEMS														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	1	2	2	3	3	1	3	2	2	3
CO2	3	3	2	3	3	2	2	3	2	3	3	3	3	2	2
CO3	3	3	3	3	3	1	2	3	3	3	2	3	3	2	2
CO4	3	3	3	3	3	1	1	2	3	1	3	3	3	2	2
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2

UNIT I FUNDAMENTALS OF COMMUNICATION SYSTEMS**9**

Basic elements of a communication systems- Modulation and demodulation- Need for modulation-types of modulation - Radio Communication spectrum-Types of signals-analog and digital- Concept of Frequency spectrum and bandwidth-Channel and noise- Types of noise- SNR-Merits and demerits of analog communication systems.

UNIT II AMPLITUDE MODULATION SYSTEMS**9**

Principles of amplitude modulation-waveforms- Modulation index- Bandwidth and Power relations in AM-Types of AM - Generation and detection methods-Comparison of various AM systems- AM Transmitters, super-heterodyne radio receivers.

UNIT III ANGLE MODULATION SYSTEMS**9**

Phase and Frequency modulation-waveforms- Frequency analysis of angle modulated waves-Bandwidth requirement of FM-Types of FM- NBFM and WBFM -Direct method and Indirect method of FM generation-FM receivers-Comparison between AM and FM.

UNIT IV PULSE MODULATION SYSTEMS AND DATA TRANSMISSION

9

Digital communication systems-Sampling theorem- Analog pulse modulation: PAM, PWM,PPM- Digital Pulse modulation: PCM, DM, ADM- transmitter and receiver- Pass band data transmission- ASK, FSK, PSK- Generation and detection-Performance comparison between different digital modulation methods.

UNIT V ADVANCED COMMUNICATION SYSTEMS

9

Spread Spectrum Techniques: Pseudo-noise sequence-Direct sequence spread spectrum - Frequency hopping spread spectrum-Satellite Communication systems: Uplink and downlink frequencies-Multiple Access techniques-FDMA,TDMA and CDMA- Mobile communication systems: Cellular concept and its fundamentals- Comparison between various mobile generation standards.

Total: 45 Hours

TEXT BOOKS

1. R.P. Singh and S.D. Sapre, "Communication Systems- Analog and Digital", Tata McGrawHill, 3rd Edition, 2014..
2. Wayne Tomasi, "Electronic Communication Systems", 6th edition, Pearson Education, 2015.

REFERENCES

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, 2016.
2. B.P.Lathi,"Modern Analog and Digital Communication systems", 3/e, Oxford University Press, 2011
3. Martin S.Roden, "Analog and Digital Communication System", 3rd Edition, PHI, 2012.
4. Sam Shanmugam "Digital and Analog Communication systems" John Wiley& Sons, 2014.

COURSE OUTCOMES

At the end of the course the students will be able to

- Identify the core values that mold the ethical behavior of an IT engineer
- Describe the ethical principles that should be followed by all the stake holders of IT
- Analyze the ethical issues related to freedom of expression
- Describe the intellectual property rights and biometric technologies
- Exercise the ethical principles that should be followed while handling advance computer technologies

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	COMPUTER AND INFORMATION ETHICS														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	3	1	3	2	2	3	3	2	2	2
CO2	2	3	3	3	1	2	3	3	3	3	3	3	3	3	2
CO3	2	3	3	2	3	2	3	3	3	3	3	3	3	1	2
CO4	2	3	3	1	2	2	3	3	3	3	1	3	3	1	2
CO5	2	3	3	2	1	3	3	3	3	2	3	3	3	1	2

UNIT I INTRODUCTION**9**

Introduction - Ethics in the Business World - Including Ethical Considerations in Decision Making - Ethics in Information Technology - IT Security Incidents - Implementing Trustworthy Computing

UNIT II ETHICS IN INFORMATION TECHNOLOGY**9**

Ethics for IT Professionals – Ethics for IT Users - Ethics for IT Organizations - The Impact of IT on the Standard of Living and Worker Productivity - The Impact of IT on HealthCare Costs

UNIT III FREEDOM OF EXPRESSION**9**

Introduction – Anonymity – Security – Privacy - Ethical and Legal Framework for Information - Social Context of Computing

UNIT IV INTELLECTUAL PROPERTY RIGHTS**9**

Introduction – Copyrights – Patents - Trade Secrets - Key Intellectual Property Issues - Biometric Technologies Ethics: Introduction and Definitions - The Biometric Authentication Process - Biometric System Components - Types of Biometric Technologies - Ethical Implications of Biometric Technologies - The Future of Biometrics

Computer Crimes: Introduction - History of Computer Crimes - Types of Computer System Attacks - Motives of Computer Crimes - Costs and Social Consequences - Computer Crime Prevention Strategies - New Frontiers for Computer Ethics: Artificial Intelligence – Cyberspace - Social Network Ecosystems - Mobile Systems

TOTAL HOURS: 45

TEXT BOOKS:

1. George W. Reynolds, “Ethics in Information Technology”, Fifth Edition, Cengage Learning, 2014.
2. Joseph Migga Kizza, “Ethical and Social Issues in the Information Age”, Fifth Edition, Springer, 2013.

REFERENCE BOOKS:

1. Gerard Ian Prudhomme, “The Handbook of Information and Computer Ethics”, First edition, Arcler Education Inc, 2016.
2. Luciano Floridi, “The Cambridge Handbook of Information and Computer Ethics” , First edition, Cambridge University Press, 2010.
3. Kenneth E. Himma and Herman T. Tavani, “The Handbook of Information and Computer Ethics”, First Edition, Wiley-Blackwell, 2008.
4. Robert N. Barger, “Computer Ethics: A Case-based Approach”, First edition, Cambridge University Press, 2008.
5. Deborah G. Johnson, “Computer Ethics (Occupational Ethics)”, Second Edition, PHI,1993

COURSE OUTCOMES:

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

- Design and develop simple programs using data structures
- Apply non-linear data structures for various real time applications
- Design shortest path algorithm for various real life applications

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	DATA STRUCTURES LABORATORY														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	1	1	1	2	1	1	2	1	1	2	3	3
CO 2	2	3	1	2	3	2	1	3	2	2	1	2	3	2	2
CO 3	3	2	3	1	3	1	2	2	2	1	2	1	3	2	3

LIST OF EXPERIMENTS

1. Implementation of Lists ,Stacks and Queues
2. Implementation of Binary Tree and Traversal Techniques
3. Implementation of Binary Search Trees
4. Implementation of AVL Trees
5. Implementation of B-trees
6. Implementation of graphs using BFS and DFS.
7. Implementation of Prim's algorithm.
8. Implementation of Kruskal's algorithm
9. Implementation of Dijkstra's algorithm
10. Implementation of Floyd's algorithm
11. Implementation of Hashing and Collision Resolution Technique.
12. Implementation of Heap
13. Implement the operations on Trie structure

TOTAL : 60 hours

COURSE OUTCOMES:

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

- Design and develop simple programs using OOPS concepts
- Apply thread and collection class for various real time applications
- Develop java program using IO streams and File class

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	1	2	2	3	3	3	3	2	2	3
CO2	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3

LIST OF EXPERIMENTS

1. Develop simple programs in java using classes and methods
2. Implement user defined Exception Handling
3. Implement method overloading and method overriding in Java
4. Develop java programs using inheritance and interfaces
5. Create Threads in java using Thread Class and Runnable Interface
6. Create an application using multiple threads
7. Develop programs using inbuilt methods of String class
8. Implement collections like List, Set, Queue, Map in Java
9. Implement Input streams and Output streams in Java
10. Develop java programs to access and perform various operations in file content
11. Implement the given use case/project using various Object oriented concepts in Java

TOTAL : 60 hours

Semester-III	U19 GE301- SOFT SKILLS AND APTITUDE – I	L	T	P	C	Marks
		0	0	2	1	100
Course Outcomes						
At the end of the course the student will be able to:						
1. Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches						
2. Solve problems of greater intricacy in stated areas of quantitative aptitude and logical reasoning						
3. Demonstrate higher levels of verbal aptitude skills in English with regard to specific topics						
1.Soft Skills	Demonstrating soft-skill capabilities with reference to the following topics:					
	<ul style="list-style-type: none"> a. Attitude building b. Dealing with criticism c. Innovation and creativity d. Problem solving and decision making e. Public speaking f. Group discussions 					
2. Quantitative Aptitude and Logical Reasoning	Solving problems with reference to the following topics:					
	<ul style="list-style-type: none"> a. Vedic Maths: Fast arithmetic, multiplications technique, Criss cross, Base technique, Square root, Cube root, Surds, Indices, Simplification. b. Numbers: Types, Power cycle, Divisibility, Prime factors & multiples, HCF & LCM, Remainder theorem, Unit digit, highest power. c. Averages: Basics of averages and weighted average. d. Percentages: Basics of percentage and Successive percentages. e. Ratio and proportion: Basics of R &P, Alligations, Mixture and Partnership. f. Profit ,Loss and Discount: Basic & Advanced PLD g. Data Interpretation: Tables, Bar diagram, Venn diagram, Line graphs, Pie charts, Caselets, Mixed varieties, Network diagram and other forms of data interpretation. h. Syllogism: Six set syllogism using Venn diagram and tick and cross method 					
3. Verbal Aptitude	Demonstrating English language skills with reference to the following topics:					
	<ul style="list-style-type: none"> a. Verbal analogy b. Tenses c. Prepositions d. Reading comprehension e. Choosing correct / incorrect sentences f. Describing pictures g. Error spotting 					

S. Ant

Department of Placement Training
Sona College of Technology,
Salem-636 005.

1

B. E / COMPUTER SCIENCE AND ENGINEERING

SEMESTER – III	PROBABILITY AND STATISTICS	L	T	P	C
U19MAT301B		3	1	0	4

COURSE OUTCOMES

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

1. apply the concepts of measures of central tendency, dispersion, correlation to the given data and analyze the results.
2. apply the concepts of random variables and their properties to generate the moments.
3. fit the suitable distribution and its properties to the real world problems and interpret the results.
4. apply the concepts of joint probability distribution and its properties to find the covariance.
5. test the hypothesis of the population using sample information.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		3	2							2	2		2
CO2	3	3		3	2							2	2		2
CO3	3	3		3	2							2	2		2
CO4	3	3		3	2							2	2		2
CO5	3	3		3	2							2	2		2

UNIT – I BASIC STATISTICS

12

Measures of central tendency (simple arithmetic mean, median, mode) – Quartiles – Measures of dispersion (range, inter-quartile range, quartile deviation, mean deviation, standard deviation, coefficient of variation) – Simple correlation – Curve fitting (straight line and parabola).

UNIT – II RANDOM VARIABLES

12

Discrete and continuous random variables – Probability mass function, probability density function, moments, moment generating function and their properties.

UNIT – III THEORETICAL DISTRIBUTIONS

12

Binomial, Poisson, geometric, uniform, exponential and normal distributions and their properties - Applications.

UNIT – IV TWO DIMENSIONAL RANDOM VARIABLES

12

Joint distributions, marginal and conditional distributions – Covariance – Correlation – Central limit theorem.

20. 05. 2020

B. E. / B. Tech. Regulations 2019

UNIT – V TESTING OF SIGNIFICANCE**12**

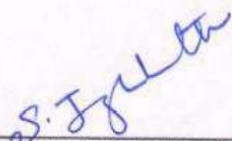
Sampling distributions - Testing of hypothesis for mean, standard deviation, variance, proportion and differences using normal and t distributions - χ^2 - tests for independence of attributes and goodness of fit and F distribution.

Theory: **45 Hours**Tutorial: **15 Hours**Total: **60 Hours****TEXT BOOKS:**

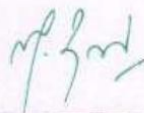
1. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition, Reprint, 2019.
2. T. Veerarajan, "Probability, Statistics and Random Processes with Queuing Theory and Queuing Networks", McGraw Hill Publishers, 4th Edition, 7th Reprint, 2018.

REFERENCE BOOKS:

1. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
2. S. Ross, "A First Course in Probability", Pearson Publishers, 9th Edition, 2019.
3. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, Reprint, 2003.
4. W. Feller, "An Introduction to Probability Theory and its Applications – Volume I", Wiley Publishers, 3rd Edition, 2008.
5. S. P. Gupta, "Statistical Methods", Sultan Chand and Sons Publishers, 15th Edition, 2012.



Prof. S. JAYABHARATHI
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Dr. M. RENUGA
BoS - Chairperson
Science and Humanities
Sona College of Technology
Salem – 636 005

20. 05. 2020

B. E. / B. Tech. Regulations 2019

MANDATORY COURSES

Sona College of Technology, Salem

Department of Sciences (Chemistry)

COURSE CODE **U19GE302** **L T P C**
COURSE NAME **MANDATORY COURSE:**
ENVIRONMENT AND CLIMATE SCIENCE **2 0 0 0**

Course outcome:

Upon completion of this course the students will be able to

- CO1** Describe the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
- CO2** Illustrate the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
- CO3** Analyze the causes, effects of various environmental pollution and their appropriate remedial measures.
- CO4** Provide solutions to combat environmental issues like global warming, acid Rain, ozone layer depletion.
- CO5** Analyze the effect of climate change in various sectors and their remedial measures.

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO - 1	3	2				2	2							-
CO - 2	2	-												-
CO - 3	3	2				2	2							2
CO - 4	3	2				2	2							2
CO - 5	3	2				2	2							2

Unit I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES L 6

Definition, Scope and Importance Forest Resources: - Use and over - exploitation, deforestation, Case Studies, Water Resources: - Use and Over-Utilization of Surface and ground water, Floods, Drought, Food Resources- Effects of Modern Agriculture, Fertilizer- Pesticide Problems--Role of an Individual in Conservation of Natural Resources.

Unit II ECOSYSTEMS AND BIODIVERSITY L 6

Structure and Function of an Ecosystem- Energy Flow in the Ecosystem -Food Chains, Food Webs and Ecological Pyramids. Introduction to Biodiversity -Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values -India as a Mega-Diversity Nation -- Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts - Endangered and Endemic Species of India - Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

Unit III ENVIRONMENTAL POLLUTION L 6

29.08.2022

B.E. / B.Tech. Regulations 2019

Definition – Causes, Effects and Control Measures of:-(A) Air Pollution(B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution, Solid Waste Management- Effects and Control Measures of Acid Rain,- Role of an Individual in Prevention of Pollution.

Unit IV FUNDAMENTALS OF CLIMATE CHANGE

L 6

Sustainable Development- - Climate Change-Causes and effects of Global Warming - Effect of global warming in food supply, plants, sea, coral reef, forest, agriculture, economy- Kyoto Protocol in reduction of greenhouse gases - Ozone Layer Depletion-mechanism, effects and control measures Montreal Protocol to protect ozone layer depletion -Rain Water Harvesting - .Effect of climate change due to air pollution Case study - CNG vehicles in Delhi.

Unit V EFFECT OF CLIMATE CHANGE

L 6

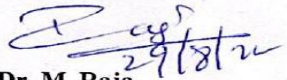
Fungal diseases in forests and agricultural crops due to climatic fluctuations - Growing energy needs - effect of climate change due to non-renewable energy resources. Renewable energy resources in the prevention of climatic changes- Effect of climatic changes in ground water table, garments, monuments, buildings, consumption of energy, agriculture and in electric power sector - Carbon credit - carbon footprint - disaster management -Role of an individual to reduce climate change.

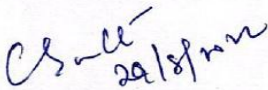
Total Number of hours: 30**Learning Resources****Text Book:**


1. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co. 2018
2. Anubha Kaushik and Kaushik, "Environmental Science and Engineering" New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

Reference Books:

1. S. Radjarejesri et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2018.
2. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
3. Erach, B., "The Biodiversity of India", Mapin Publishing P.Ltd., Ahmedabad, India.
4. ErachBharucha, "Textbook of Environmental Studies for Undergraduate Courses", 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad - 500029.


Dr. M. Raja
Course Coordinator / Sciences


Dr. C. Shanthi
HOD / Sciences


Dr. M. Renuga
Chairperson BOS,
Science and Humanities

29.08.2022

B.E. / B.Tech. Regulations 2019

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV Regulations 2019
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19MAT401A	Numerical and Regression Analysis	3	1	0	4	60
2	U19CS401	Operating Systems	3	0	0	3	45
3	U19CS402	Database Management Systems	3	0	0	3	45
4	U19CS403	Design and Analysis of Algorithms	3	0	0	3	45
5	U19GE405	Principles of Management	3	0	0	3	45
6	U19GE403	Mandatory course: Essence of Indian Traditional Knowledge	2	0	0	0	30
Practical							
7	U19CS404	Operating Systems Laboratory	0	0	4	2	60
8	U19CS405	Database Management Systems Laboratory	0	0	4	2	60
9	U19GE401	Soft Skills and Aptitude -II	0	0	2	1	30
Total Credits						21	

Approved By

Chairperson, Computer Science and Engineering BoS
Dr.B.Sathiyabhama

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Fourth Semester BE CSE Students and Staff, COE

B. E / COMPUTER SCIENCE AND ENGINEERING

SEMESTER – IV	NUMERICAL AND REGRESSION ANALYSIS	L	T	P	C
U19MAT401A		3	1	0	4

COURSE OUTCOMES

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

1. solve algebraic, transcendental and linear system of equations using appropriate numerical techniques.
2. apply the Newton's forward, backward, divided difference formulae and Lagrange's formula to obtain the polynomial interpolation and their derivatives at desired point.
3. apply the Trapezoidal rule, Simpson's rule, Romberg's method and Gaussian quadrature formula to evaluate definite integrals.
4. solve the linear and nonlinear ordinary differential equations of first order by single and multi-step methods.
5. compute simple and partial correlation coefficients and analyse regression equations for estimation and prediction purposes.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		3	2							2	2		2
CO2	3	3		3	2							2	2		2
CO3	3	3		3	2							2	2		2
CO4	3	3		3	2							2	2		2
CO5	3	3		3	2							2	2		2

UNIT – I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 12

Solution of algebraic and transcendental equations: Regula-Falsi method – Fixed point theorem (statement only) – Fixed point iteration method – Newton Raphson method – **Solution of linear system of equations:** Cholesky decomposition method – **Eigen values of a matrix:** Power method.

UNIT – II INTERPOLATION AND NUMERICAL DIFFERENTIATION 12

Newton's forward and backward difference formulae – Newton's divided difference interpolation – Lagrange's interpolation – Inverse Lagrange's interpolation – Approximation of derivatives using interpolation polynomials.

UNIT – III NUMERICAL INTEGRATION 12

Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rules – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT – IV INITIAL VALUE PROBLEMS – ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods: Taylor series method – Euler's method – fourth order Runge – Kutta method for solving first order ordinary differential equations. **Multi step methods:** Milne's and Adams – Bash forth predictor and corrector methods for solving first order ordinary differential equations.

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UNIT – V REGRESSION ANALYSIS**12**

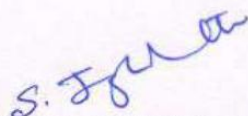
Multiple and partial correlation – linear regression – relationship between correlation and regression – multiple and partial regressions.

Theory: **45 Hours**Tutorial: **15 Hours**Total: **60 Hours****TEXT BOOKS:**

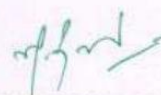
1. R. L. Burden and J. D. Faires, "Numerical Analysis" Cengage Publishers, 9th Edition, 2016.
2. S. P. Gupta, "Statistical Methods", Sultan Chand and Sons Publishers, 15th Edition, 2012.

REFERENCE BOOKS:

1. T. Veerarajan and T. Ramachandran, "Numerical Methods with programs in C", McGraw Hill Publishers, 2nd Edition, Reprint, 2019.
2. C. F. Gerald and P. O. Wheatly, "Applied Numerical Analysis", Pearson Publishers, 7th Edition, 2004.
3. B. S. Grewal, "Numerical Methods in Engineering & Science with Programs in C, C++ & MATLAB", Khanna Publishers, 11th Edition, 2013.
4. K. Sankar Rao, "Numerical Methods for Scientists and Engineers", Prentice Hall Publishers, 4th Edition, 2018.
5. P. Kandasamy, K. Thilagavathy and K. Gunavathy, "Numerical Methods", S. Chand Publishers, 5th Edition, 2013.



Prof. S. JAYABHARATHI
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BoS - Chairperson
Science and Humanities
Sona College of Technology
Salem – 636 005

13. 01. 2021

B. E. / B. Tech. Regulations 2019

COURSE OUTCOMES

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

- Compare the different operating system structures
- Evaluate the various process scheduling algorithms
- Design algorithms for achieving process synchronization
- Evaluate the various memory management techniques
- Analyze the effectiveness of a file system

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1	1	2	2	1	3	2	2	3
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CO3	3	3	3	3	1	1	2	1	2	3	1	3	1	3	3
CO4	3	3	3	2	2	1	2	1	1	2	1	3	1	3	3
CO5	3	3	3	3	3	2	2	1	3	1	1	3	2	3	3

UNIT I INTRODUCTION AND OPERATING SYSTEM STRUCTURES 9

Introduction - Mainframe Systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection - System Components – Operating System Services – System Calls – System Programs – System Structure – Virtual Machines – System Design and Implementation.

UNIT II PROCESS MANAGEMENT 9

Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication- Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - Case study – Linux Scheduling.

UNIT III PROCESS SYNCHRONIZATION AND DEADLOCKS 9

Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors. System Model – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks.

UNIT IV STORAGE MANAGEMENT AND FILE SYSTEM INTERFACE 9

Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging - Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing - File Concept – Access Methods – Directory Structure – File System Mounting – Protection. Case study – Linux memory management

UNIT V FILE SYSTEM IMPLEMENTATION AND MASS STORAGE STRUCTURE 9

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management - Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management - Case study – Linux file system.

Total: 45 hours

TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2012.

REFERENCES

1. Harvey M. Deitel, P.J.Deitel and D.R.Choffnes, “Operating Systems”, 3rd Edition, Pearson Education Pvt. Ltd, 2004.

2. Andrew S. Tanenbaum and Herbert Bos, “Modern Operating Systems”, Pearson Education Pvt. Ltd, 4th Edition, 2016

3. William Stallings, “Operating System Internals and Design Principles”, Pearson Education Pvt. Ltd, 9th Edition, 2018

COURSE OUTCOMES

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

- Demonstrate the need, background, architecture and evolution of database management system and to introduce the concepts of ER model
- Design and develop relational models with an emphasis on how to organize, maintain, retrieve and secure information efficiently and effectively from a RDBMS
- Design and evaluate the normality of a logical data model, and correct any anomalies and identify the requirements of data storage and indexing techniques
- Implement query processing methodologies using various operators
- Design and develop methods for multiple transactions are managed concurrently and recovered efficiently during failures

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1	1	1	2	2	1	3	2	3	3
CO2	3	3	3	2	2	2	1	1	1	1	1	3	1	3	3
CO3	3	3	3	3	2	2	2	1	2	1	1	3	1	3	3
CO4	3	3	3	3	3	3	2	2	2	2	2	3	1	3	3
CO5	3	3	3	3	3	2	3	2	3	1	2	3	2	3	3

UNIT I INTRODUCTION**9**

Database and Database Users: Characteristics of database approach- Advantages of using the DBMS Approach-Database Applications.

Database system concepts and architecture: Data models-Schemas- Instance-Three schema architecture and data independence- DBMS languages and interfaces- database system Environment-ER model.

UNIT II RELATIONAL MODEL**9**

Relational data model-relational constraints: Relational model concepts- Relational constraints and Relational data base schema- update operations- basic Relational algebra operations- additional relational operations.

SQL: Data definition and Data type- specifying SQL constraints- Basic queries-insert-delete- update-complex queries- views- assertions and triggers- dynamic SQL.

Database security and Authorization: Security issues- grant/revoke privileges- SQL injections.

UNIT III RELATIONAL DATABASE DESIGN**9**

Functional dependencies and normalization: Functional dependencies-Normal forms: 1NF- 2NF- 3NF-Boyce Codd NF- decomposition-Multivalued dependencies and 4NF- join dependencies and 5NF.

UNIT IV DATA STORAGE AND QUERY PROCESSING

9

Disk Storage, Basic File Structures, and Hashing: Secondary Storage Device-RAID-Operations on Files-Heap Files-Sorted Files-Hashing Techniques.

Indexing Structures for Files: Types of Single-Level Ordered Indexes- Multilevel Indexes-- Dynamic Multilevel Indexes Using B-Trees and B+-Trees.

Query Processing: Translating SQL Queries into Relational Algebra- Algorithms for External Sorting-Algorithms for SELECT and JOIN Operations- Algorithms for PROJECT and Set Operations.

UNIT V TRANSACTION MANAGEMENT

9

Transaction Processing: Introduction-Transaction and System Concepts- desirable Properties of Transactions-Schedules based on Recoverability- Schedules based on Serializability.

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control- Timestamp Ordering.

Database Recovery Techniques: Recovery Concepts, Deferred Update, Immediate Update-Shadow Paging- ARIES recovery algorithm.

Total: 45 hours

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth and Sudarshan. S, “Database System Concepts”, Sixth Edition, McGrawHill, 2010

REFERENCES

1. Ramez Elmasri and Shamkant Navathe, “Fundamentals of Database Systems ”, 6th Edition, Addison-Wesley, 2011

2. Raghuram Ramakrishnan, “Database Management System”, Tata McGraw-Hill Publishing Company, 2003

3. Date. C. J, Kannan. A, Swamynathan. S, “An Introduction to Database Systems”, 8th Edition, Pearson Education, 2006

4. Rajesh Narang, “Database Management systems”, PHI Learning pvt. Ltd, New Delhi, 2006

COURSE OUTCOMES

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

- Analyze the algorithms that are used to solve various problems.
- Generate and solve the recurrences for divide and conquer techniques.
- Solve the problems using greedy and dynamic programming paradigms.
- Design the algorithms for solving the backtracking and transform and conquer methodologies.
- Apply the branch and bound technique to solve various problems.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	1	1	2	2	1	3	2	3	3
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CO3	3	3	3	3	2	3	2	1	2	1	1	3	2	2	3
CO4	3	3	3	2	2	2	2	1	1	2	2	3	2	1	3
CO5	3	3	3	3	2	2	2	1	2	1	1	3	2	3	3

UNIT I FUNDAMENTALS OF ALGORITHM ANALYSIS**9**

Introduction - Problem solving techniques-Analysis framework – Time space tradeoff – Asymptotic notations – Conditional asymptotic notation – Properties of Big-Oh notation – Recurrence equations – Mathematical Analysis of Non-recursive algorithms - Mathematical analysis of recursive Algorithms – Analysis of linear search - Empirical analysis - Algorithm visualization

UNIT II BRUTE FORCE AND DIVIDE AND CONQUER STRATEGIES**9**

Brute Force: Selection Sort - Bubble Sort – String matching - Exhaustive Search: Travelling Salesman problem - Divide and Conquer: General Method – Binary Search – Closest-pair problem – Merge Sort-Quick Sort.

UNIT III GREEDY AND DYNAMIC PROGRAMMING PARADIGMS**9**

Greedy Algorithms: General Method – Container Loading – Huffman code – Knapsack problem - Dynamic Programming: General Method – Multistage Graphs – Optimal binary search trees.

UNIT IV BACKTRACKING AND TRANSFORM AND CONQUER METHODOLOGIES**9**

Backtracking: General Method – N-Queen's problem – Sum of subsets – Graph coloring – Hamiltonian problem. Transform and conquer : Presorting – Gaussian elimination.

UNIT V GRAPH AND BRANCH AND BOUND STRATEGIES

9

Graph : Connected Components – Bi-connected components – Branch and Bound: General Method (FIFO and LC) – Job assignment problem - 0/1 Knapsack problem – Introduction to NP-Hard and NP-Completeness.

Total: 45 hours

TEXT BOOKS

1. Anany Levitin “Introduction to the design and Analysis of Algorithms”, Pearson Education, Second Edition, 2014.

REFERENCES

1. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", Third Edition, Prentice Hall of India Pvt. Ltd, 2009.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, 1999.
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2008.
4. K.S. Easwarakumar, “ Object Oriented Data Structures Using C++”, Vikas Publication House Pvt Ltd, First Edition, 2000.

COURSE OUTCOMES

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

- Identify the organizational factors and roles of Management
- Apply planning, forecasting and decision making in real time applications
- Apply the concepts of organizing in an organization
- Analyze the concepts of delegation of authority and Organization culture.
- Apply the concepts of controlling in an organization

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO3	2	3	2	1	2	2	2	3	2	2	1	3	1	3	3
CO4	2	3	3	2	1	2	2	3	2	2	3	3	1	3	3
CO5	3	3	3	3	1	3	3	2	2	3	3	3	2	3	3

UNIT I INTRODUCTION**9**

Definitions of Management-Scope of Management-Levels of Management-Functions and Roles of a manager-Evolution of Management thought-Organisation and Environmental Factors-Forms of Business Organizations-Corporate Social Responsibility-recent trends and challenges in global management scenario.

UNIT II PLANNING**9**

Definition of Planning-Nature and purpose of planning-Planning process-Types of plans-Objectives-Management of objective(MBO)-Management by exception-Types of strategies-Decision Making: definition and process-Types of managerial decision-group decision making techniques-Decision making under different conditions-forecasting and its techniques.

UNIT III ORGANISING**9**

Definition of organizing-Nature and purpose of organizing-Formal and informal organizations-organization charts-Organization structures-Span of control-factors determining effective span-line and staff authority-Departmentation-Centralization and Decentralization-Delegation of authority-staffing-selection and recruitment-Orientation-Training and development-Performance Appraisal-organization change-Staffing

UNIT IV DIRECTING**9**

Directing: nature and purpose-Motivation and Satisfaction-Motivation theories-job enrichment-definition of leadership-elements of leadership-Leadership styles-leadership theories-Communication-process and barriers to effective communication-Organization culture-Elements and types of culture-Managing cultural diversity.

UNIT V CONTROLLING

9

Process of controlling-Types of control-Budgetary and non-budgetary control techniques- MIS- Managing productivity-Constant control-purchase control- Maintenance control-quality control-planning operations-performance standards-Measurement of performance-Remedial actions-Recent Trends in Management

Total :45 hours

TEXT BOOKS

1. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India) Pvt. Ltd., 14th Edition, 2017.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

REFERENCES

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" Pearson Education, 9th Edition, 2016.
2. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,2006.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 2012

COURSE OUTCOMES

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

- Simulate various Unix commands using shell scripts
- Design, develop and demonstrate various page replacement policies and memory management techniques
- Design and develop an deadlock avoidance algorithm

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	2	2	2	2	1	3	2	2	3	2	3
CO2	3	3	3	2	2	1	2	2	1	3	2	2	3	2	3
CO3	3	3	3	3	2	2	2	2	3	3	3	2	3	3	3

(Implement the following on LINUX platform. Use C for high level language implementation)

LIST OF EXPERIMENTS

1. UNIX - Basic Commands.
2. Shell programming (Using looping, control constructs etc.,)
3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.
6. Implementation of CPU scheduling algorithms: FCFS, SJF, Round Robin & Priority Scheduling.
7. Implementation of the Producer – Consumer problem using Semaphores.
8. Implementation of Banker's algorithm.
9. Implementation of memory management schemes (First fit, Best fit & Worst fit)
10. Implement page replacement algorithms (FIFO & LRU)

Total: 60 hours

COURSE OUTCOMES

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

- Design schema for the given database by creating appropriate tables and write SQL queries using DDL and DML statements to retrieve information out of it.
- Create views and triggers that automatically indicate the updating of data in the tables
- Apply the concept of databases to the real time application development

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO2	3	3	3	3	2	2	2	2	1	3	2	2	3	2	3
CO3	3	3	3	3	2	2	2	2	3	3	3	2	3	3	3

LIST OF EXPERIMENTS

1. Create a relational database system using DDL commands with constraints
2. Update the database system using DML commands
3. Query the database using simple and complex queries
4. Create and update views
5. High level programming language extensions (Control structures, Procedures and Functions)
6. Working with triggers
7. Use of front end tools to manipulate the database
8. Menu Design
9. Generate reports using a reporting tool
10. Database Design and implementation of an application system. (Suggested Mini Project)

Total: 60 hours

Semester – IV	U19GE401-SOFT SKILLS AND APTITUDE – II	L T P C Marks 0 0 2 1 100
Course Outcomes		
At the end of the course the student will be able to:		
1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches		
2. Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests		
3. Demonstrate greater than SSA-I level of verbal aptitude skills in English with regard to given topics and score 65-70% marks in company-specific internal tests		
1.Soft Skills	Demonstrating soft-skill capabilities with reference to the following topics: a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions	
2. Quantitative Aptitude and Logical Reasoning	Solving problems with reference to the following topics: a. Equations: Basics of equations , Linear, Quadratic Equations of Higher Degree and Problem on ages. b. Logarithms, Inequalities and Modulus c. Sequence and Series: Arithmetic Progression, Geometric Progression, Harmonic Progression, and Special Series. d. Time and Work: Pipes & Cistern and Work Equivalence. e. Time, Speed and Distance: Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks and Escalators. f. Arithmetic and Critical Reasoning: Arrangement, Sequencing, Scheduling, Network Diagram, Binary Logic, and Logical Connection. g. Binary Number System.- Binary to decimal, Octal, Hexadecimal	
3. Verbal Aptitude	Demonstrating English language skills with reference to the following topics: a. Critical reasoning b. Theme detection c. Verbal analogy d. Prepositions e. Articles f. Cloze test g. Company specific aptitude questions	

S. Anita
06/01/2023

Dr.S.Anita

Head/Training
Department of Placement Training
Sona College of Technology,
Salem-636 005.

SEMESTER – IV

MANDATORY COURSE

U19GE403 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

(Common for EEE, CIVIL, MECH and CSE)

L	T	P	C
2	0	0	0

Course Outcomes

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

1. understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.
2. show an ability to comment critically on curriculum proposals that aim to promote science citizenship/scientific literacy
3. communicate using common medical and psychological terminology, including the skill to discuss commonly used medications, supplements, and surgical procedures
4. use effective oral and written language skills to communicate scientific data and ideas
5. describe the fundamentals of yoga and its importance

Unit I

- Introduction to Vedas
- Traditional methodology of Veda – Sat Angas
- Types of Vedas and their application
- Sub Veda – Ayurveda - their modern day application

Unit II

- Basics of Applied Vedic Science
- Modern day application of Vedas and procedure
- Ancient Indian Scientific thoughts
- Introduction to the Vedic language “Sanskrit”

UNIT – III- Modern science

- Introduction – modern science
- Objectives – modern science
- Architecture in ancient India

UNIT – IV Technology

- India's contribution to science and technology (from ancient to modern)
- Nobel laureates of Indian origin and their contribution
- India in space
- Latest achievement from Jan – 2017

23.01.2021

B.E. / B.Tech. Regulations 2019

UNIT – V- Yoga and Holistic Health Care

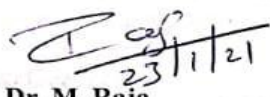
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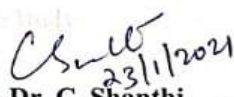
- Fundamentals of yoga and holistic health
- Human biology
- Diet and nutrition
- Life management
- Contemporary yogic models – case study

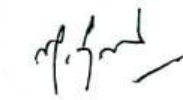
References

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016.
4. Roshan Dalal The Vedas: An Introduction to Hinduism's Sacred Texts, Penguin Books 2014. ISBN 13: 9780143066385
5. Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN : 9781988207049

Total: 30 HOURS


23/1/21
Dr. M. Raja
Course Coordinator / Sciences


23/1/2021
Dr. C. Shanthi
HOD / Sciences


Dr. M. Renuga
Chairperson BOS,
Science and Humanities

Total: 30 HOURS


23.01.2021

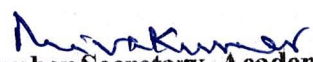
B.E. / B.Tech. Regulations 2019

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V Regulations 2019
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19CS501	Computer Networks	3	0	0	3	45
2	U19CS502	Software Engineering	3	0	0	3	45
3	U19CS503	Theory of Computation	3	0	0	3	45
4	U19EC509	Embedded System Design	3	0	0	3	45
5	noc23-cs91	NPTEL : Software Testing	3	0	0	3	45
6	U19CS901	Professional Elective : Software Project Management	3	0	0	3	45
	U19CS902	Professional Elective : Agile Methodologies					
Practical							
7	U19CS504	Computer Networks Laboratory	0	0	4	2	60
8	U19CS505	Software Development Laboratory	0	0	2	1	30
9	U19GE501	Soft Skills and Aptitude III	0	0	2	1	30
Total Credits						22	

Approved By


Chairperson, Computer Science and Engineering BoS
Dr.B.Sathiyabhama


Member Secretary, Academic Council
Dr.R.Shivakumar


Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Fifth Semester BE CSE Students and Staff, COE

CSE
2019

COURSE OUTCOMES

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

- Compare and analyze the various life cycle models of software process
- Design an appropriate analysis model that suits the requirement
- Create models using UML for various applications
- Apply different design strategies in software application development the strategies
- Apply appropriate testing strategies to uncover errors in the software

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	SOFTWARE ENGINEERING														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	2	2	1	2	2	3	3	3	3	3	3
CO2	2	2	2	3	3	1	2	2	3	3	3	3	2	2	1
CO3	1	1	2	2	3	1	3	2	2	3	3	2	3	3	3
CO4	2	1	2	2	2	2	2	2	2	3	3	2	2	2	2
CO5	2	3	2	2	3	2	2	2	2	2	3	2	2	2	2

UNIT I SOFTWARE PROCESS

9

Software process structure – Process models: Waterfall model, Incremental process models, Evolutionary process models, Specialized process models – Unified Process-Agile development: Agile process – Extreme programming – Scrum

UNIT II SOFTWARE REQUIREMENTS

9

Requirements engineering – Eliciting requirements - Developing use cases – Building the analysis model – Negotiating requirements – Requirements monitoring – Validating requirements – Requirements analysis

UNIT III UML MODELING

9

Introduction – Unified Modeling Language – Static model – Dynamic model – Unified Modeling Language - UML diagrams – UML class diagram – Use case diagram – UML dynamic modeling : UML interaction diagrams – UML state chart diagram – UML activity diagram – Implementation Diagrams – Component diagram – Deployment diagram

UNIT IV SOFTWARE DESIGN

9

Design concepts and model – Architectural design: Software architecture, Architectural styles – Architectural design – Component level design: Designing class-based components, Conducting component level design – User interface design: User interface analysis and design – Interface analysis – Interface design steps - Design patterns.

UNIT V SOFTWARE TESTING FUNDAMENTALS

9

Software testing strategies: Strategic approach – Issues – Test strategies for conventional and Object Oriented software – Validation and System testing – Debugging – Testing conventional applications: White box testing – Basis path testing – Control structure testing – Black box testing – Software configuration management – SCM repository – SCM process.

Total: 45 hours

TEXTBOOK

1. Roger S .Pressman, Software engineering- Apractitioner’s Approach, McGraw-Hill International Edition, 8th edition, 2015.

REFERENCES

1. Ali Bahrami, "Object Oriented Systems Development", 1st Edition, Tata McGraw-Hill, New Delhi, 2008.
2. Ian Sommerville, Software engineering, Pearson education Asia, 9th edition, 2011.
3. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
4. James F Peters and Witold Pedrycz, "Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi, 2000.


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COURSE OUTCOMES

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

- Identify the suitable network services for the given network applications
- Comprehend transport layer and its protocols
- Select and apply appropriate routing algorithm
- Analyze the various functionalities of data link layer
- Describe the key concepts and functions of physical layer

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	COMPUTER NETWORKS														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	2	1	1	3	1	2	3	2	3	1
CO2	3	2	2	2	3	2	2	1	3	3	2	3	1	3	3
CO3	3	2	3	2	3	2	1	1	3	3	3	3	1	3	3
CO4	3	3	3	3	3	1	2	1	3	3	3	3	2	3	3
CO5	3	3	2	2	2	1	1	1	3	3	3	3	2	3	3

UNIT I INTRODUCTION AND APPLICATION LAYER

9

The Internet – Protocol – The network edge – ISPs and Internet backbones ; Introduction to Software Defined Networks ; Introduction to cloud ; Protocol layers and their service models; Network applications – The Web and HTTP – FTP – SMTP – DNS – SNMP.

UNIT II TRANSPORT LAYER

9

Connectionless transport – User Datagram Protocol; Connection Oriented transport – Transmission Control Protocol; Congestion control – TCP congestion control; Introduction to Quality of Service.

UNIT III NETWORK LAYER

9

Circuit Switching – Packet Switching – Virtual Circuit and Datagram Networks – The Internet protocol (IP) – Datagram format – IPv4 addressing– Sub netting – ICMP – Ipv6 – Routing algorithms – Link State Routing – Distance Vector Routing – RIP – OSPF – BGP – Multicast – IGMP.

UNIT IV DATA LINK LAYER

9

Error-Detection and -Correction Techniques - Framing - Flow Control and Error control protocols (Simple - STOP and WAIT - Go Back-N ARQ - Selective Repeat ARQ - Piggybacking) – Media access protocols – Channel partitioning protocols – Random access protocols – Link layer addressing – ARP– Ethernet – Token Ring – Switches – Wireless LAN.

UNIT V PHYSICAL LAYER

9

Data and signals – Performance – Digital Transmission– Analog Transmission ; Bandwidth Utilization- – Multiplexing – Spread Spectrum ; Transmission media – Guided media –Unguided media.

Total: 45 hours

TEXT BOOK

1. James F. Kurose, K. W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, 7th Ed, Addison-Wesley, 2017.
2. Behrouz A. Ferouzan,”Data Communications and Networking”, Fifth Edition, Tata McGraw-Hill Publication, 2013.

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.
2. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2014.
3. Andrew Tanenbaum, Computer Networks, Prentice Hall of India, fifth edition, 2010.
4. Douglas E. Comer, “Computer Networks and Internets with Internet Applications”, Fifth Edition, Pearson Education, 2009.


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COURSE OUTCOMES

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

- Compare various and analyze various Finite Automata
- Construct finite automata from regular expressions and identify the properties of regular language
- Design recognizers for different formal languages and Push Down Automata
- Convert CFG to normal forms and design Turing machines for various problems
- Determine the decidability and intractability of computational problems

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	THEORY OF COMPUTATION														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	2	1	1	3	1	2	3	2	3	1
CO2	3	2	2	2	3	2	2	1	3	3	2	3	1	3	3
CO3	3	2	3	2	3	2	1	1	3	3	3	3	1	3	3
CO4	3	3	3	3	3	1	2	2	3	3	3	3	2	3	3
CO5	3	3	2	2	2	1	1	2	3	3	3	3	2	3	3

UNIT I AUTOMATA

9

Introduction to formal proof – Additional forms of proof – Inductive proofs –Chomsky Hierarchy- Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non- deterministic Finite Automata (NFA) – Finite automata with epsilon transitions. Case Study: Cruise Control.

UNIT II REGULAR EXPRESSIONS AND LANGUAGES

9

Regular expression – FA and Regular expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of automata.

UNIT III CONTEXT-FREE GRAMMAR AND LANGUAGES

9

Context Free Grammar (CFG) – Parse trees – Ambiguity in grammars and languages – Definition of the pushdown automata – Languages of a pushdown automata – Equivalence of pushdown automata and CFG – Deterministic pushdown automata- Pumping lemma for CFL – Closure properties of CFL

UNIT IV TURING MACHINE

9

Normal forms for CFG – Turing machines -Language of TM -Programming Techniques for TM- Variants in TM. Case study: Church's Thesis-Godelization.

UNIT V UNDECIDABILITY

9

Recursively Enumerable (RE) - An Undecidable problem that is RE – Halting Problem– Post's correspondence problem –Rice Theorem-Classes P and NP –NP Completeness-Relationship between Time Complexity and Space Complexity.

Total: 45 hours

TEXT BOOK

1. Hopcroft, J.E. Motwani, R. and Ullman, J.D "Introduction to Automata Theory, Languages and Computations", 2nd Edition, Pearson Education, 2013.

REFERENCES

1. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.
2. Martin, J., "Introduction to Languages and the Theory of Computation", 3rd Edition, TMH, 2003.
3. Lewis, H. and Papadimitriou, C.H "Elements of the Theory of Computation", 2nd Edition, Pearson Education/PHI, 2003.
4. Greenlaw, "Fundamentals of Theory of Computation, Principles and Practice", Elsevier, 2008.


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COURSE OUTCOMES

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

- Comprehend the roles of the project manager and opportunities in project management
- Assess and evaluate the projects based on various approaches
- Apply the best practices to develop competencies and skills in planning and controlling Projects
- Analyze the scheduling resources using various models
- Discuss managing people and organizing teams

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	SOFTWARE PROJECT MANAGEMENT														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	3	2	3	3	2	2	3	2	2
CO2	3	3	3	3	3	2	2	1	3	2	3	2	3	3	3
CO3	3	3	3	3	3	2	2	2	3	2	2	2	3	3	3
CO4	3	3	3	3	3	2	2	1	3	2	2	2	3	3	2
CO5	3	3	3	3	3	3	2	2	2	3	2	2	3	2	2

UNIT I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9

Project Definition – Contract Management – Activities Covered by Software Project Management – Overview of Project Planning – Stepwise Project Planning.

UNIT II PROJECT EVALUATION 9

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation – Software effort Estimation

UNIT III ACTIVITY PLANNING 9

Objectives – Project Schedule – Sequencing and Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning and Control.

UNIT IV MONITORING AND CONTROL 9

Resource allocation - identifying and scheduling resources – publishing resource and cost schedule – scheduling sequence - Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring–

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 SALEM - 636 005

Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS

9

Introduction – Understanding Behavior – Organizational Behavior - Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures – Stress – Health And Safety – Case Studies.

Total: 45 hours

TEXT BOOK

1. Bob Hughes, Mikecoterrell, “Software Project Management”, Tata McGraw Hill, Fifth Edition,,2010.

REFERENCES

1. Ramesh, Gopaldaswamy, "Managing Global Projects", Tata McGraw Hill, 2006.
2. Royce, “Software Project Management”, Pearson Education, 2005.
3. Jalote, “Software Project Management in Practice”, Pearson Education, 2002.
4. Robert T. Futrell, Donald F. Shefer and Linda I. Shefer, “Quality Software Project Management”, Pearson Education, 2006.

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COURSE OUTCOMES

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

- Apply Agile principles to deliver software projects
- Utilize the scrum's emphasis on project management and self-organization
- Experiment user stories, story points, project velocity and visualization tools
- Design XP practices and pair programming practices for solving a given problem
- Use appropriate methods to ensure fast delivery of software

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	AGILE METHODOLOGIES														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	1	1	2	2	1	2	3	1	3
CO2	3	2	1	2	3	1	1	1	3	2	3	2	3	1	3
CO3	3	2	2	2	3	1	1	1	1	2	2	3	3	1	3
CO4	3	2	3	2	2	1	1	1	2	2	2	3	3	1	3
CO5	3	2	1	2	1	1	1	1	3	3	1	3	3	1	3

UNIT I AGILE PRINCIPLES

9

What is Agile? – Understanding the Agile Values – Silver Bullet Methodology – Agile to the Rescue – A fractured perspective - Agile Manifesto and Purpose behind each practice – Agile Elephant – Where to start with a new Methodology – 12 principles of Agile Software – The Customer is always Right – Delivering the project – Communicating and Working Together – Project Execution – Constantly improving the project and the team – Agile Project.

UNIT II SCRUM AND SELF-ORGANIZING TEAMS

9

Basic pattern for a Scrum Project – Rules of Scrum – Command-and-Control Team – Self-Organizing Teams – Scrum Values – Daily Scrum – Sprints, Planning and Retrospectives.

UNIT III SCRUM PLANNING AND COLLECTIVE COMMITMENT

9

User stories – Conditions of Satisfaction – Story Points and Velocity – Burndown Charts – Planning and Running a Sprint – GASP – Scrum Values Revisited – Practices Do Work Without the Values – Company Culture Compatible with Scrum Values.

UNIT IV XP AND INCREMENTAL DESIGN

9

Primary Practices of XP – The XP values help the team change their mindset – An effective mindset starts with the XP values – Understanding the XP principles – Feedback Loops – Code and Design – Make Code and Design Decisions at the Last Responsible Moments – Incremental Design and the Holistic XP.

UNIT V LEAN, KANBAN AND AGILE COACH

9

Lean Thinking – Commitment, Options Thinking and Set Based Development – Create Heroes and Magical Thinking – Eliminate Waste – Value Stream Map – Deliver As Fast As Possible – Visualize work in progress – Pull Systems – The Principles of Kanban – Improving Your Process with Kanban – Measure and Manage Flow – Little's Law – Emergent Behavior with Kanban – The Agile Coach – Shuhari – The Principles of Coaching.

TOTAL: 45

TEXT BOOK:

1. Andrew Stellman & Jennifer Greene, "Learning Agile: Understanding Scrum, XP, Lean and Kanban", 1st Edition, O'Reilly Media Inc, 2015.

REFERENCES:

1. Robert C. Martin, "Agile Software Development: Principles, Patterns, and Practices", Pearson Prentice Hall, 2011.
2. Eric Brechner, "Agile Project Management with Kanban", 1st Edition, Microsoft Press, 2015.

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COURSE OUTCOMES

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

- Develop the network applications using any high level programming language
- Configure and analyze network traffic using netstat, TCPDump, Wireshark and CISCO packet tracer tools
- Simulate the different network topologies using ns-2

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	COMPUTER NETWORKS LABORATORY														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	3
CO2	3	3	3	3	3	2	3	1	3	3	1	3	3	3	3
CO3	3	3	3	3	1	1	3	3	1	3	1	3	3	3	3

LIST OF EXPERIMENTS:

1. Simulation of HTTP protocol using TCP Socket.
2. Programs using TCP and UDP Sockets (like getting date and time from server, Chat application, etc...).
3. Programs using RMI.
4. Network analysis using TCP Dump, Netstat, Trace Route tools.
5. Simulating a simple LAN using CISCO Packet tracer.
6. Simulating an organization LAN with multiple subnets using CISCO Packet tracer.
7. Simulation of a web server based network using CISCO Packet tracer.
8. Simulation of smart home network with IoT devices using CISCO Packet tracer.
9. Network topology configuration using ns2.
10. Packet sniffing and traffic analysis using WIRESHARK.

Total: 60 hours

COURSE OUTCOMES:

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

- Design and implement projects using OO concepts
- Use UML analysis and design diagrams in various applications
- Apply appropriate design patterns for the given scenarios

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	SOFTWARE DEVELOPMENT LABORATORY														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	3	2	2	2	2	2	3	3	3	3	3
CO2	1	2	3	3	3	2	1	2	3	2	2	3	3	3	1
CO3	1	2	1	2	2	2	1	2	2	2	3	2	2	2	2

List of Exercises / Experiments:

1. Define the problem statement
2. Identify use cases and develop business use case model (System use case diagram).
3. Identify the conceptual classes (boundary, controller and entity classes) and develop a domain model with UML Class diagram.
4. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
5. Draw the State Chart diagram and UML Activity diagram.
6. Develop Interface pattern.
7. Identify the User Interface and domain objects. Draw the UML package diagram.
8. Implement the User Interface (presentation) layer using thin client with HTML/Java/JSP/Servlet/PHP
9. Implement the Business layer (domain object) using JDBC adapter
10. Implement the Data layer using JDBC mapper

TOTAL: 30**REFERENCES/MANUAL/SOFTWARE:**

1. IBM RAD
2. Java / Eclipse IDE/.Net Framework/Visual Studio Package

COURSE OUTCOMES

At the end of each unit, the students will be able to

- Discuss the hardware and software architectures of embedded system.
- Develop embedded design using suitable RTOS objects.
- Discuss the architecture, memory and peripherals of 8051 microcontroller
- Develop the application based on 8051 using embedded C programs.
- Investigate the architecture of ARM processor and peripherals

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	EMBEDDED SYSTEM DESIGN														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	2	2	1	2	2	3	2	2	2
CO2	3	3	3	3	2	3	3	2	3	2	3	2	3	3	3
CO3	3	2	2	2	2	2	2	2	1	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	2	3	2	3	3	3
CO5	2	2	2	2	2	1	2	2	1	1	1	3	2	2	2

UNIT I Architecture of Embedded Systems

9

Introduction – Application Areas – Categories of Embedded System – Specialties of Embedded System – Recent Trends in Embedded System – Overview of Embedded System Architecture – Hardware Architecture – Software Architecture – Communication Software – Process of Generation of Executable Image – Development-Testing Tools.

UNIT II Design of Embedded Systems

9

Hardware design-Selection of processor-Software design- Implementation-Integration and testing-Types of testing-Types of Hardware Platforms-Hardware description of AVR microcontroller development and its features-Introduction to RTOS –Architecture of the kernel-Static and Dynamic Scheduling Algorithms

UNIT III 8051 Microcontroller

9

Introduction to Microprocessor – Microcontroller - Architecture of 8051 Microcontroller – signals – I/O ports – memory – counters and timers – serial data I/O – interrupts.

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UNIT IV Embedded 'C' programming in 8051

9

Data types and time delay – I/O Programming - Logic Operations – Data conversion-Data serialization- Timer -Counter.

UNIT V ARM Processor and Peripherals

9

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU.

Total Hour 45

Text Book

1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 4th Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2016
2. Mazidi, Mazidi & McKinlay, "8051 Microcontroller and Embedded System", Pearson New International Edition, 2nd Edition, 2014.
3. Steve Furber, "ARM System on Chip Architecture", Pearson Publications, 2nd Edition, 2015.

REFERENCE BOOKS

1. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dreamtech press, 2016
2. Raj Kamal "Embedded Systems Architecture Programming and Design" 2nd Edition TMH, 2010
3. Shibu K V, "Introduction to Embedded Systems", McGraw Hill, 2009.


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V. Jem

Semester –V	U19GE501 : SOFT SKILLS AND APTITUDE - III	L	T	P	C	Marks
		0	0	2	1	100
Course Outcomes						
At the end of the course the student will be able to:						
1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches						
2. Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests						
3. Display effective language knowledge to construct sentences with subject verb agreement and select the best alternative for the underlined parts of the sentences, and fill in the blanks in the given passages with suitable forms of words and their synonyms.						
1.SOFT SKILLS	Demonstrating soft-skill capabilities with reference to the following topics: <ol style="list-style-type: none"> Career planning Resume writing Group discussion Teamwork Leadership skills Interview skills Mock interviews Mock GDs 					
2.QUANTITATIVE APTITUDE AND LOGICAL REASONING	Solving problems with reference to the following topics : <ol style="list-style-type: none"> Geometry: 2D, 3D, Coordinate Geometry, and Height & Distance. Permutation&Combinations:Principles of counting, Circular Arrangements and Derangements. Probability: Addition & Multiplication Theorems, Conditional Probability and Bayes Theorem. Statistics : Mean Median, Mode, Range and Standard Deviation. Interest Calculation :Simple Interest and Compound Interest Crypto arithmetic: Addition and Multiplication based problem. Logical Reasoning :Blood Relations, Directions Test, Series, Odd man out, Analogy, Coding & Decoding, Problems and Input – Output Reasoning. Statement & Assumptions, Statements & Arguments, Inference. Company Specific Pattern :Infosys and TCS company specific problems 					
3. VERBAL APTITUDE	Demonstrating English language skills with reference to the following topics: <ol style="list-style-type: none"> Subject verb agreement Selecting the best alternative for the stated parts of given sentences Reading comprehension Contextual synonyms Sentence fillers Writing a story for a given picture Company specific aptitude questions 					

S. Anita
8/6/2023

Dr.S.Anita

Head/Training

Dr. S. ANITA

Professor and Head

Department of Training,

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SALEM-636 005.

Syllabi for

**B.E/B.Tech Honours (Specialization in the
same Discipline)**

B.E/B.Tech Honours

B.E/B.Tech Minor

courses

COURSE OUTCOMES

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

- Design simple web pages using HTML and XHTML
- Design and implement dynamic web pages using DHTML, JavaScript and Cascading style sheets
- Write programs to create multi-tier application using model view controller pattern
- Design and develop real-time web applications using PHP
- Writing simple applications using Java web services

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	1	3	1	1	1	2	1	1	2	1	3	1
CO2	1	2	3	1	2	1	1	1	2	1	2	1	2	3	1
CO3	2	3	3	2	3	1	1	2	3	2	2	2	2	3	2
CO4	2	3	3	2	3	1	1	2	3	2	2	2	2	3	2
CO5	2	3	3	1	3	1	1	1	1	1	2	3	2	2	2

UNIT I WEB BASICS AND HTML 9

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols - The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics -Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0.

UNIT II CSS 8

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout Beyond the Normal Flow-CSS3.0.

UNIT III CLIENT SIDE SCRIPTING 9

The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-StatementsOperators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers. Introduction to the Document Object Model-DOM History and

Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling.

UNIT IV **SERVER SIDE SCRIPTING** **10**

Introduction to PHP – Programming in Web Environment – Variables – Constants – Data Type – Operators – Statements – Functions – Arrays – OOP – String Manipulation and Regular Expression – File Handling and Data Storage – PHP and SQL Database – PHP and LDAP – PHP Connectivity – Sending and Receiving E-mails – Debugging and Error Handling.

UNIT V **AJAX AND WEB SERVICES** **9**

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods - Overview of Java Web Services – Creating, Publishing, Testing and Describing a Web services (WSDL) - JAX-WS – RESTful Web Services.

Total: 45 hours ✓

TEXT BOOK

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Fifth Edition, Pearson Education, 2018.

REFERENCES

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2017.
2. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) 2Ed. Paperback – 2016 by DT Editorial Services.
3. Robert. W. Sebesta, "Programming the World Wide Web", Eighth Edition, Pearson Education, 2020.
4. Marty Hall and Larry Brown," Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
5. Gopalan N.P. and Akilandeswari.J, "Web Technology", Prentice Hall of India, 2014.


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COURSE OUTCOME:

At the end of this course, students should be able to:

- Set up a development environment for React.js projects and create basic React components using JSX syntax.
- Implement state management in React using both class components and functional components.
- Design and implement custom hooks for reusable functionality.
- Use React Router for client-side routing and navigation.
- Build and deploy React applications to production.

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	2	1	2	2	2	3	3	1	2	3
CO2	3	3	2	2	2	2	1	2	2	2	3	3	1	2	3
CO3	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3
CO4	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3
CO5	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3

UNIT 1 INTRODUCTION TO REACT.JS 9

Front end web development types - What is React.js? - Why use React? - Understanding the virtual DOM - Setting up the development environment - Creating a basic React component - JSX syntax and component rendering - React component lifecycle.

UNIT II REACT COMPONENTS AND PROPS 9

React Components – Types of Component - Creating functional components - Class components and state management - Handling events in React - Component lifecycle methods - Working with props and prop types - Conditional rendering in React

UNIT III REACT DOM AND HOOKS 9

How “React” works with the DOM ?- Creating and updating React elements - Handling events in React – React Hooks – Custom Hooks

UNIT IV REACT ROUTER AND ROUTING 9

Introduction to React Router - Setting up routes in a React application - Route parameters and query strings - Nested routing and nested components - Redirecting and handling 404 errors - Navigation and history manipulation.

React and Redux integration - Middleware and asynchronous actions - Server-side rendering (SSR) with React - React and performance optimization - Testing React applications - Building and deploying React applications.

List of Experiments:

(T-30, P-30hrs) TOTAL: 60H

1. Implement the React application using Class Components
2. Implement the React application using Functional Components
3. Implement the React application using React Hooks
4. Implement a React App which displays your curriculum vitae
5. Implement a simple calculator Application using React JS
6. Implement a Simple Login form using React JS
7. Implement a navigation application using React JS
8. Implement a React App for rendering JSON data

TEXT BOOK:

1. Stoyan Stefanov , "React Up and Running: Building Web Applications".

REFERENCES:

1. Kirupa Chinnathambi, "Learning React: A Hands-On Guide to Building Web Applications Using React and Redux"
2. Anthony Accomazzo, Ari Lerner, Nate Murray, Clay Allsopp, "Fullstack React: The Complete Guide to ReactJS and Friends"


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COURSE OUTCOMES

At the end of this course, the students will be able to

- Comprehend the concepts required for exploratory data analysis.
- Implement the data visualization using Matplotlib.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.
- Use Data exploration and visualization techniques for multivariate and time series data.

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)												PSO1	PSO2	PSO3
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12			
CO1	3	3	2	2	1	2	1	2	2	2	3	3	1	2	3
CO2	3	3	2	2	2	2	1	2	2	2	3	3	1	2	3
CO3	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3
CO4	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3
CO5	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3

UNIT I INTRODUCTION

9

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data -Comparing EDA with classical and Bayesian analysis – Software tools for EDA – Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

UNIT II UNIVARIATE ANALYSIS

9

Introduction to Single variable: Distribution Variables – Numerical Summaries of Level and Spread -Scaling and Standardizing – Inequality.

UNIT III BIVARIATE ANALYSIS

9

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

UNIT IV MULTIVARIATE AND TIME SERIES ANALYSIS

9

Introducing a Third Variable – Causal Explanations – Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

UNIT V USECASES IN EDA AND EMERGING TRENDS

9

Automated EDA Tools - EDA in the Cloud - EDA in AI and Data Science - Ethical and Responsible EDA.

(T-30 + P-30)

TOTAL: 60 HL ✓

List of Experiments:

1. Create histograms to visualize the distribution of a single numerical variable
2. Construct density plots to visualize the probability density function of a continuous variable
3. Create scatter plots to visualize the relationship between two numerical variables
4. Construct pair plots to visualize the pairwise relationships between multiple numerical variables
5. Stock Market Analysis
6. Iris Dataset Analysis
7. COVID-19 Case Prediction
8. Seasonal Product Sales Analysis

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020. (Unit 1)
2. Catherine Marsh, Jane Elliott, Exploring Data: An Introduction to Data Analysis for Social Scientists, Wiley Publications, 2nd Edition, 2008. (Unit 2,3,4)

REFERENCES:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, Fundamentals of Data Visualization, Oreilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, 2nd Edition, CRC press, 2015.
4. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017.

COURSE OUTCOMES

At the end of the course the students will be able to:

- Analyze the challenges to design a recommender system.
- Implement machine-learning and data-mining algorithms in recommender systems data sets.
- Design systems for analyzing big data in various domains.
- Implement a simple and secure recommender system.
- Evaluate the performance evaluation of recommender systems based on various metrics

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO3	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3
CO4	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3
CO5	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3

UNIT 1 INTRODUCTION

9

Introduction and basic taxonomy of recommender systems – Goals of Recommender Systems- Domain-Specific Challenges in Recommender Systems -Recommender Systems and Human Computer Interaction-Applications of Recommender systems.

UNIT II DATA MINING METHODS FOR RECOMMENDER SYSTEMS

9

Data Preprocessing- Classification- Cluster Analysis -Association Rule Mining- similarity measures- Dimensionality reduction – Singular Value Decomposition

UNIT III CONTENT-BASED RECOMMENDATION SYSTEMS

9

Basic Components of Content-Based Systems- Preprocessing and Feature Extraction-Feature Representation and Cleaning- Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms

UNIT IV COLLABORATIVE FILTERING

9

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection).

UNIT V CURRENT TRENDS

9

Deep Learning-Based Approaches-Hybrid Recommender Systems-Explainable Recommender Systems-Reinforcement Learning in Recommender Systems-Knowledge Graphs for Recommendations-Multimodal Recommender Systems.


TOTAL : 45 Hours ✓

TEXT BOOK:

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.

REFERENCE BOOKS:

1. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
2. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Sytems Handbook, 1st ed, Springer (2011),
3. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.


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COURSE OUTCOMES

At the end of the course, student will able to

- Understand the basics of cybercrime and computer forensics .
- Apply different computer forensic tools to collect evidences.
- Analyze and validate forensics data .
- Perform penetration testing of an organizational network.
- Detect the vulnerabilities in a given web site.

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO3	3	3	3	3	3	2	2	1	1	3	3	3	3	3	3
CO4	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	1	1	3	3	3	3	3	3

UNIT I INTRODUCTION TO CYBER CRIME AND FORENSICS

9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Role of ECD and ICT in Cybercrime - Classification of Cyber Crime. The Present and future of Cybercrime - Cyber Forensics -Steps in Forensic Investigation - Forensic Examination Process - Types of CF techniques - Forensic duplication and investigation - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT II EVIDENCE COLLECTION AND FORENSICS TOOLS

9

Processing Crime and Incident Scenes – Digital Evidence - Sources of Evidence -Working with File Systems. - Registry - Artifacts - Current Computer Forensics Tools: Software/ Hardware Tools - Forensic Suite - Acquisition and Seizure of Evidence from Computers and Mobile Devices - Chain of Custody- Forensic Tools.

UNIT III ANALYSIS AND VALIDATION

9

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics - Analysis of Digital Evidence - Admissibility of Evidence - Cyber Laws in India - Case Studies.

UNIT IV ETHICAL HACKING

9

Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing - Email Tracking.

UNIT V ETHICAL HACKING IN WEB

9

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Applications - SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.

TEXT BOOK:

TOTAL: 45 HL ✓

1. Bill Nelson, Amelia Phillips and Christopher Steuart, " Guide to Computer Forensics and Investigations", Cengage Learning, India Sixth Edition, 2019.
2. Kimberly Graves, "CEH official Certified Ethical Hacking Review Guide", Wiley India Edition, Version 11, 2021

REFERENCES:

1. Deje, S. Murugan, "Cyber Forensics", Oxford University Press, India, 2018
 2. John R. Vacca, "Computer Forensics", Cengage Learning, 2005
 3. Marjie T. Britz, "Computer Forensics and Cyber Crime: An Introduction 3rd Edition, Prentice Hall, 2013.
 4. Ankit Fadia " Ethical Hacking, Second Edition, Macmillan India Ltd, 2006
- Kenneth C. Brancik "Insider Computer Fraud", Auerbach Publications Taylor & Francis Group- 2008.


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COURSE OUTCOMES

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

- Describe the various threats and computer security
- Discuss the various web site attacks and design secured OS
- Design protection mechanisms against threats in Networks
- Analyze the various database vulnerabilities
- Compare the various security models and standards

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO2	3	3	3	3	3	2	3	2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	2	3	1	3	3	3	3	3	3
CO4	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	1	3	3	3	3	3	3

UNIT I INTRODUCTION AND PROGRAM SECURITY

9

Computer security -Threats-Harm-Vulnerabilities-Controls. Program security: Secure programs – Non-malicious Program Errors –Controls against Program threat.

UNIT II SECURITY IN USER WEB AND OPERATING SYSTEMS

9

Securing user web: Browser attacks-Web attacks targeting users-Obtaining user and website data-Email attacks. Security in Operating Systems- Security in the design of operating systems.

UNIT III SECURITY IN NETWORKS

9

Threats in networks – Encryption – Virtual Private Networks – PKI – SSH – SSL – IPsec – Content Integrity –Access Controls – Wireless Security – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems– Secure e-mail.

UNIT IV SECURITY IN DATABASES

9

Security requirements of database systems – Reliability and Integrity in databases – Two Phase Update –Redundancy/Internal Consistency – Recovery – Concurrency/Consistency – Monitors – Sensitive Data – Types of disclosures – Inference.

UNIT V SECURITY MODELS AND STANDARDS

9

Secure SDLC – Secure Application Testing – Security architecture models – Trusted Computing Base – BellLaPadula Confidentiality Model – Biba Integrity Model – GrahamDenning Access Control Model – HarrisonRuzzo-Ulman Model – Secure Frameworks –COSO – CobiT – Compliances – PCI DSS – Security Standards – ISO27000 family of standards – NIST.

TEXT BOOK:

✓ TOTAL: 45 H

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Pearson education, 2015.

REFERENCE BOOKS:

1. William Stallings, "Cryptography and Network Security: Principles and Practices", Seventh Edition, Prentice Hall, 2017.
2. Michael Howard, David LeBlanc, John Viega, "24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them", First Edition, McGraw Hill Osborne Media, 2009.
3. Matt Bishop, "Introduction to Computer Security", Addison-Wesley, 2004
4. Michael Whitman, Herbert J. Mattord, "Management of Information Security", Fifth Edition, Cengage publishers, 2017.
5. Matt Bishop, "Computer Security: Art and Science", First Edition, Addison-Wesley, 2002.
6. https://www.owasp.org/index.php/Top_10_2010
7. https://www.pcisecuritystandards.org/security_standards/pci_dss.shtml
<http://cwe.mitre.org/top25/index.html>


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COURSE OUTCOMES

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

- Identify the suitable cloud computing model and services for the given application
- Understand the role of virtualization in cloud computing
- Deploy private and public cloud in real-time environment
- Analyze various threats and risks associated with cloud security
- Evaluate the challenges involved in migrating to cloud

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO3	3	2	3	3	3	2	2	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	2	2	3	3	2	2	3	3	2	2
CO5	3	3	2	3	3	3	3	3	2	3	3	3	3	2	2

UNIT I OVERVIEW OF CLOUD COMPUTING**8**

Brief history and evolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing - Why Cloud Computing, Cloud service models (IaaS, PaaS & SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing - Introduction to AWS Public Cloud Vendor.

UNIT II VIRTUALIZATION**8**

Basics of virtualization, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing - Container and Container Orchestration in Virtualization – Overview on Dockers – Kubernetes.

UNIT III WORKING WITH PRIVATE AND PUBLIC CLOUDS**10**

Private Cloud Definition - Characteristics of Private Cloud - Private Cloud deployment models, Private Cloud Vendors – CloudStack - Eucalyptus and Microsoft Private Cloud – Benefits and Challenges - Private Cloud implementation in Amazon EC2 service
What is Public Cloud - Why Public Cloud - When to opt for Public Cloud - Public Cloud Service Models and Public Cloud Vendors and offerings (IaaS, PaaS, SaaS) - Demonstrating public

cloud with AWS - Introduction to EC2 and Storage services of AWS - Private vs. Public Cloud – When to choose.

UNIT IV OVERVIEW OF CLOUD SECURITY

10

Explain the security concerns in Traditional IT - Introduce challenges in Cloud Computing in terms of Application Security - Server Security and Network Security - Security reference model - Abuse and Nefarious Use of Cloud Computing - Insecure Interfaces and APIs - Malicious Insiders - Shared Technology Issues - Data Loss or Leakage - Account or Service Hijacking - Unknown Risk Profile - Shared security model between vendor and customer in IAAS/PAAS/SAAS - Implementing security in AWS.

UNIT V FUTURE DIRECTIONS IN CLOUD COMPUTING

9

When and not to migrate to Cloud - Migration paths for cloud - Selection criteria for cloud deployment - Issues/risks in cloud computing - Future technology trends in Cloud Computing – Overview on osmotic computing.

Total: 45 hours

TEXT BOOKS

1. Cloud Computing: Principles and paradigms By Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, 2011

REFERENCES

1. Cloud computing: Implementation, management and security By Rittinghouse, John, W., CRC Press,2009
2. Cloud Computing Bible, By Barrie Sosinsky, Wiley, 2011
3. Cloud Computing and Virtualization, Dac-Nhuong Le, Raghvendra Kumar, John Wiley & Sons, 2018
4. Cloud Computing Architected: Solution Design Handbook by Rhoton, John,2013
5. Cloud Security, A comprehensive Guide to Secure Cloud Computing by Krutz, Ronald L.; Vines, Russell Dean, Wiley,2010


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CSE
VI

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI under Regulations 2019 (CBCS)
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact hours
Theory							
1	U19CS601	Principles of Compiler Design	3	0	0	3	45
2	U19CS602	Full Stack Development	2	0	2	3	60
3	U19CS603	Artificial Intelligence	3	0	0	3	45
4	U19CS909	Professional Elective Machine Learning	3	0	0	3	45
	U19CS913	Professional Elective Business Intelligence					
	U19CS908	Professional Elective Bigdata Analytics					
5	U19CS918	Professional Elective Cloud Computing	3	0	0	3	45
	U19CS921	Professional Elective Green Computing					
Open Elective							
6	U19BM1001	Hospital Management	3	0	0	3	45
	U19CE1002	Municipal Solid Waste Management					
	U19CE1003	Energy Efficiency and Green Building					
	U19EC1006	Mobile Technology and Its Applications					
	U19EE1002	Energy Conservation and Management					
	U19MC1004	Fundamentals of Robotics					
	U19ME1004	Renewable Energy Sources					
	U19ME1002	Industrial Safety					
	U19FT1002	Garment Manufacturing Technology					
	U19EE1003	Innovation, IPR and Entrepreneurship Development					
	U19EE1004	Renewable Energy Systems					
U19FT1001	Fundamentals of Fashion Design						
Practical							
7	U19CS604	Compiler Design Laboratory	0	0	4	2	60
8	U19CS605	Artificial Intelligence Laboratory	0	0	4	2	60
9	U19GE601	Soft Skills and Aptitude – IV	0	0	2	1	30
Total Credits						23	

Approved By

Chairperson, Computer Science and Engineering BoS

Dr.B.Sathiyabhama

Member Secretary, Academic Council

Dr.R.Shivakumar

Chairperson, Academic Council & Principal

Dr.S.R.R.Senthil Kumar

Copy to:- HOD/Computer Science and Engineering, Sixth Semester BE CSE Students and Staff, COE

COURSE OUTCOMES

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

- Comprehend the fundamental concepts of compilers
- Design and implement a lexical analyzer
- Design and analyze various top down and bottom up parsers
- Generate the Intermediate code using various syntax directed translation techniques
- Design and analyze code generation schemes and optimized compilers

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)												PSO 1	PSO 2	PSO3
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12			
CO1	2	2	2	3	3	1	1	3	2	2	1	3	3	3	3
CO2	2	2	3	3	3	2	1	3	2	2	1	3	3	3	3
CO3	3	3	3	3	3	1	1	3	2	2	2	3	3	3	3
CO4	2	3	3	3	3	1	1	3	2	2	1	3	3	3	3
CO5	3	3	3	3	3	1	2	3	2	2	1	3	3	3	3

UNIT I INTRODUCTION TO COMPILERS

7

Translators-Compilation and Interpretation - Language processors - The Phases of Compiler Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools.

UNIT II LEXICAL ANALYSIS

9

Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to a DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of a Lexical Analyzer for a sample Language.

UNIT III SYNTAX ANALYSIS

10

Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser - LR (0)item Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for Sample Language

UNIT IV SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODE GENERATION

9

Syntax Directed Definitions- Run-Time Environments- Storage Organization-Storage Allocation Strategies-Symbol Tables-Intermediate Code Generation – Intermediate languages – Declarations – Assignment Statements-Boolean expressions – Case statements-

Backpatching - Procedure calls.

UNIT V CODE OPTIMIZATION AND CODE GENERATION 10

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis-Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm- Optimizing compilers for modern architecture

Case Study: Single pass and two pass compilers.


Total: 45 hours

TEXT BOOK

1. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, "Compilers – Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2014.

REFERENCES

1. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: Dependence-based Approach", Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation, "Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers Elsevier Science, 2004. 4. Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", Pearson Education, 2008.
4. Kenneth C. Loude , "Compiler Construction Principles and Practice", Cengage Learning, 1997


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COURSE OUTCOMES

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

- Comprehend the basics of JavaScript and importance of MERN stack
- Apply the role of React in designing front-end components
- Analyze the design issues in the development of backend components using Node.js and Express
- Develop program using MongoDB as a database system
- Understand the advanced features of full stack development

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
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CO2	3	2	3	1	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	1	3	3	3	2	2	3	2	3	3	3	3
CO4	3	3	3	2	3	3	3	2	2	3	2	3	3	3	3
CO5	3	3	3	2	3	3	3	2	2	3	2	3	3	3	3

UNIT I JAVASCRIPT AND BASICS OF MERN STACK**6**

JavaScript Fundamentals - Objects - Generators, advanced iteration – Modules- DOM tree- Node properties - browser events - Event delegation - UI Events -Forms, controls - Document and resource loading - Mutation observer - Event loop: micro-tasks and macro-tasks - MERN Components- React - Node.js - Express - MongoDB - Need for MERN - Server- Less Hello World - Server Setup- nvm - Node.js - npm.

UNIT II REACT**6**

React Introduction - React ES6 - React Render HTML - React JSX - Components -React Classes -Composing Components - Passing Data - Dynamic Composition - React state - setting State –AsyncState Initialization - Event Handling Communicating from Child to Parent - Stateless Components -Designing components- React Forms - React CSS - React SaaS

UNIT III NODE.JS AND EXPRESS**6**

Node.js basics - Local and Export Modules - Node Package Manager - Node.js web server - Node.js File system - Node Inspector - Node.js EventEmitter - Frameworks for Node.js - Express.js WebApp - Serving static Resource - Node.js Data Access - Express REST APIs - REST - Resource Based - HTTP Methods as Actions - JSON- Express - Routing - Handler Function - Middleware -The List API - Automatic Server Restart - Testing - The Create API - Using the List API - Using the Create API- Error Handling - Template Engine.

UNIT IV MONGODB

6

MongoDB - MongoDB Basics - Documents - Collections - Query Language - Installation - The mongo Shell - Schema Initialization - MongoDB Node.js Driver - Reading from MongoDB - Writing to MongoDB - CRUD operations - projections - Indexing - Aggregation - Replication - Sharding - Creating backup - Deployment.

UNIT V ADVANCED FEATURES

6

Modularization and Webpack - Routing with React Router - Forms - More Filters in the List API - UIComponents - Update API - Delete API - React-Bootstrap - Bootstrap Installation - Navigation - Table and Panel - Forms - Alerts - Modals - Server Rendering - Basic Server Rendering - Handling State - MongoDB Aggregate - Pagination - Higher Order Components Search Bar - Google SignIn - Session Handling

Theory 30 hours Practical 30 hours Total: 60 hours

LIST OF EXPERIMENTS

1. Design a webpage using HTML, CSS and Javascript
2. Implement a dynamic webpage using React
3. Implement a signup/login form using React
4. Implement a simple Node.js server application
5. Integrate Node.js with SQL Database (MySQL/PostgreSQL/Oracle)
6. Integrate Node.js with No SQL Database (MongoDB/Cassandra)
7. Register the user login details in Redis using email
8. Implement a script in Node.js to send email with a default content
9. Implement a version control using GitHub
10. Develop an simple Android/iOS application

TEXT BOOK

1. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, A Press Publisher, 2019.

REFERENCE

1. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker, Frank Zammetti, Apress; 1st edition (1 January 2020).

WEB REFERENCE

- <https://infyspringboard.onwingspan.com>
- <https://reactjs.org/>
- <https://nodejs.org>
- www.Expressjs.com
- www.mongodb.com

COURSE OUTCOMES

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

- Design an intelligent agent by considering the nature of environment and applications
- Apply suitable search technique to solve the real world problems
- Create knowledge base for any application using propositional/first order logic
- Design multi agent system for any real time application
- Develop a communicative agent for NLP application

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO4	3	3	3	2	2	2	2	2	2	3	3	3	2	3	3
CO5	3	3	3	2	2	1	2	3	2	1	3	1	2	3	3

UNIT I INTRODUCTION**9**

Introduction to Artificial Intelligence-The Foundations of Artificial Intelligence - The History of Artificial Intelligence-Intelligent Agents: Agents and Environments-The Concept of Rationality-The Nature of Environments-The Structure of Agents- Problem-Solving Agents- Example problems.

UNIT II PROBLEM SOLVING USING SEARCH TECHNIQUES**9**

Uninformed Search Strategies- Avoiding Repeated States- Searching with Partial Information- Informed Search and Exploration: Informed (Heuristic) Search Strategies- Heuristic Functions- Local Search Algorithms and Optimization Problems- Constraint Satisfaction problems-Adversarial search- minimax algorithm- Alpha-Beta pruning.

UNIT III KNOWLEDGE AND REASONING**9**

Knowledge-Based agents – Logic –Propositional logic – First order logic- Representation – Syntax and semantics – Knowledge engineering – Inference in First order logic- Unification and lifting- Forward and backward chaining-Resolution- learning Agents-Different forms of Learning.

UNIT IV SOFTWARE AGENTS**9**

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems, Tools to implement MAS.

Communication: Phrase Structure Grammars - A Formal Grammar for a Fragment of English- Syntactic Analysis (Parsing) – Augmented Grammar and Semantic Interpretation - Machine translation –Speech recognition.- Robot – Hardware – Perception – Planning – Moving - Tool for Artificial Intelligence -Tensor flow and IBM Watson.

Total: 45 hours

TEXT BOOK

1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Prentice Hall, 2015.

REFERENCES

1. Elaine Rich, Kevin Knight, Shiva Shankar B. Nair , "Artificial Intelligence", McGraw Hill, 2017
2. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, Harcourt Asia Pvt. Ltd., 2009.
3. George F. Luger, “Artificial Intelligence-Structures and Strategies for Complex Problem Solving”, Pearson Education, 2009.
4. Gerhard Weiss, —Multi Agent SystemsI, Second Edition, MIT Press, 2013.
5. Michael Wooldridge, "An Introduction to Multi Agent Systems", John & Wiley , 2009


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COURSE OUTCOMES

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

- Construct NFA and minimized DFA from a given regular expression using C program
- Use LEX and YACC tool to implement a lexical analyzer and parser for the grammar
- Generate a code for a given intermediate code

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO2	2	3	3	3	3	2	1	3	2	3	3	3	3	3	3
CO3	2	3	3	3	3	2	1	3	2	3	3	3	3	3	3

LIST OF EXPERIMENTS:

1. Construction of NFA.
2. Construction of minimized DFA from a given regular expression.
3. Use LEX tool to implement a lexical analyzer.
4. Use YACC and LEX to implement a parser for the grammar.
5. Implement a recursive descent parsing.
6. Construction of operator precedence parse table.
7. Implementation of symbol tables.
8. Implementation of shift reduced parsing algorithms.
9. Construction of LR parsing table.
10. Generation of code for a given intermediate code.
11. Implementation of code optimization techniques.

Total: 60 hours


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COURSE OUTCOMES

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

- Design heuristics and apply different search techniques in game playing and problem solving
- Create knowledge base using Predicate logic
- Apply knowledge representation and natural Language processing concepts in implementing chat bot applications and semantic search

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO2	3	3	3	3	3	2	2	2	2	3	2	2	2	3	3
CO3	3	3	3	2	3	3	3	3	2	2	1	2	2	3	3

LIST OF EXPERIMENTS:

(Java/Python for Ex.1-7 and any chat bot creator platform such as wit.ai, IBM Watson, Botsify, etc... for Ex.8)

1. Implement state space search using the following algorithms:
 - I. Hill climbing algorithm
 - II. A* Algorithm
2. Adversarial search and Game Playing.
3. Creating rule base and infer the proof using First order Predicate logic.
4. Solving n-Queen's problem.
5. Solving travelling salesman problem
6. Develop Multi agent system for a real time problem.
7. Information retrieval using semantic search.
8. Designing a Chat bot application.

Total: 60 hours

Semester –VI	U19GE601: SOFT SKILLS AND APTITUDE – IV (Common to all dept except Civil)	L	T	P	C	Marks
Course Outcomes At the end of the course the student will be able to:						
1. Demonstrate capabilities in job-oriented company selection processes using the hands-on approach						
2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests						
3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in company-specific internal tests						
1. Soft Skills	Demonstrating Soft -Skills capabilities with reference to the following topics: a. Mock group discussions b. Mock interviews c. Mock stress interviews					
2. Quantitative Aptitude and Logical Reasoning	Solving problems with reference to the following topics: a. Functions and Polynomials b. Clocks and Calendars c. Data Sufficiency: Introductions, 3 Options Data Sufficiency, 4 Options Data Sufficiency and 5 Options Data Sufficiency. d. Logical reasoning: Cubes, Non Verbal reasoning and Symbol based Reasoning. e. Decision making table and Flowchart Campus recruitment papers: Solving of previous year questions paper of all major recruiters f. Miscellaneous: Cognitive gaming Puzzles-(Picture, Word and Number based), IQ Puzzles, Calculation Techniques and Time Management Strategies. g. Trigonometry.- Concepts					
3. Verbal Aptitude	Demonstrating English language skills with reference to the following topics: a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Writing a story on given pictures g. Company specific verbal questions					

30 Hours

S. Anita
18/12/2023

Dr.S.Anita
Professor and Head
Department of Training
Dr. S. ANITA
Professor and Head
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SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005.

COURSE OUTCOMES

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

- Comprehend the machine learning concepts
- Construct probabilistic, discriminative and generative models for real-time applications
- Apply typical clustering algorithms for different types of applications
- Build graphical models for real-time applications
- Design advanced machine learning models

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO3	3	3	3	3	3	3	1	1	2	1	2	2	3	3	3
CO4	3	3	3	3	3	2	1	1	2	1	2	2	2	3	3
CO5	3	3	3	2	3	2	2	1	-	2	1	2	1	1	1

UNIT I INTRODUCTION

9

Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms – A Brief Review of Probability Theory – Turning Data into Probabilities – The Bias-Variance Trade off.

UNIT II SUPERVISED LEARNING

9

Linear Models for Regression – Linear Basis Function Models – The Bias-Variance Decomposition – Bayesian Linear Regression – Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression – Linear Models for Classification – Discriminant Functions – Probabilistic Generative Models – Probabilistic Discriminative Models – Laplace Approximation – Bayesian Logistic Regression – Common Classification Algorithms – k-Nearest Neighbors – Decision Trees – Random Forest model – Support Vector Machines.

UNIT III UNSUPERVISED LEARNING

9

Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM) – Latent Dirichlet Allocation (LDA).

UNIT IV GRAPHICAL MODELS

9

Bayesian Networks – Conditional Independence – Markov Random Fields – Learning – Naive Bayes Classifiers – Markov Model – Hidden Markov Model.

UNIT V **ADVANCED LEARNING**

9

Reinforcement Learning – Representation Learning – Neural Networks – Active Learning – Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines – Deep Learning.

Total: 45 hours

TEXT BOOK

1. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Prentice Hall of India, 2015.

REFERENCES

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
3. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, CRC Press, 2014.
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 2017.
5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Second Edition, Springer, 2008.
6. Fabio Nelli, "Python Data Analytics with Pandas, Numpy, and Matplotlib", Second Edition, Apress, 2018.

COURSE OUTCOMES

- At the end of the course, the student will be able to,
- Demonstrate the processes associated with Business Intelligence framework
- Solve a business scenario, by identifying the metrics, indicators and make recommendations to achieve the business goal
- Develop analytical and critical thinking skills for the development of integrative plans for enterprise-wide systems that optimize enterprise performance.
- Design an enterprise dashboard that depicts the key performance indicators which helps in decision making
- Apply business intelligence concepts in cloud computing, ERP systems

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
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CO3	3	3	3	3	3	3	1	1	2	1	2	2	3	3	3
CO4	3	3	3	3	3	2	1	1	2	1	2	2	2	3	3
CO5	3	3	3	2	3	2	2	1	-	2	1	2	1	1	1

UNIT-I INTRODUCTION TO BUSINESS INTELLIGENCE

9

Introduction to digital data: Introduction, Types – structured, semi-structured and unstructured

Introduction to OLTP and OLAP: OLTP Vs OLAP, Architectures (MOLAP, ROLAP, HOLAP), OLAP Operations

BI Definitions & Concepts: BI Framework, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BI Process, BI Technology- BI Roles & Responsibilities, Business Applications of BI, BI best practices

UNIT-II BASICS OF DATA INTEGRATION

9

Data Integration: Concepts, needs and advantages of using data integration, introduction to common data integration approaches, Meta data - types and sources, Introduction to data quality, data profiling concepts and applications. **Kettle Software:** Introduction to ETL using Pentaho data Integration

UNIT-III INTRODUCTION TO MULTI-DIMENSIONAL DATA MODELING 9

Multidimensional data model : Introduction to data and dimension modeling, data modeling basics, Types, Techniques, fact and dimension tables, Dimensional models

Measures and Metrics: Introduction to business metrics and KPIs, KPI usage in companies

Creating cubes using Microsoft Excel

UNIT-IV BASICS OF ENTERPRISE REPORTING 9

Reporting: A typical enterprise, Malcolm Baldrige - quality performance framework, Balanced scorecard, Enterprise dashboard, Balanced scorecard vs. enterprise dashboard, Best practices in the design of enterprise dashboards Enterprise reporting using MS Access / MS Excel

UNIT -V BI APPLICATIONS AND CASE STUDIES 9

Applications: Understanding BI and mobility, BI and cloud computing, BI for ERP systems, Social CRM and BI **Case Study Briefs:** Good Lift HealthCare group, Ten to Ten retail store

Total : 45 hours

TEXT BOOKS

1. RN Prasad and Seema Acharya, "Fundamental of Business Analytics", Wiley India Pvt. Ltd, 2017.

REFERENCES

1. John Boyer, Bill Frank, Brian Green, Tracy Harris, and Kay Van De Vanter "Business Intelligence Strategy: A Practical Guide for Achieving BI Excellence", IBM Corporation, 2010.
2. R. Sharda, D. Delen, & E. Turban .Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. ; Pearson/Prentice Hall, 2015.
3. Swain Scheps "Business Intelligence for Dummies", Wiley Publishing Inc, 2008.
4. Cindi Howson " Successful Business Intelligence: Secrets to making BI a killer App", McGraw Hill, 2008.
5. Elizabeth Vitt, Michael Luckevich, Stacia Misner "Business Intelligence: Making Better Decisions Faster", Microsoft Press, 2002

COURSE OUTCOMES

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

- Compare different types of Big Data
- Comprehend Data Science fundamentals
- Design and develop simple applications using Hadoop and MapReduce
- Write queries using NoSQL Databases
- Design applications using Hive and Pig Databases

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO3	2	2	2	1	2	3	1	2	2	1	2	1	3	2	2
CO4	3	2	1	2	2	2	1	3	2	1	2	1	3	2	2
CO5	3	2	1	2	2	2	1	3	3	1	2	1	3	2	2

UNIT I INTRODUCTION TO BIG DATA**9**

Classification of Digital Data - Characteristics of Data - Evolution of Big Data, Definition of Big Data - Challenges with Big Data - Characteristics of Big Data - Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment - A Typical Hadoop Environment.

UNIT II DATA SCIENCE FUNDAMENTALS**9**

Big Data Analytics - Classification of Analytics - Challenges in Big Data - Technologies to handle Challenges Posed by Big Data - Data Science - Data Scientist, Terminologies Used in Big Data Environments - Basically Available Soft State Eventual Consistency (BASE) - Few Top Analytics Tools.

UNIT III HADOOP**9**

Introduction to Hadoop - RDBMS versus Hadoop, Distributed Computing Challenges - History of Hadoop - Hadoop Overview - Use Case of Hadoop, Hadoop Distributors - HDFS (Hadoop Distributed File System) - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator) - Interacting with Hadoop Ecosystem - MapReduce Programming.

UNIT IV NOSQL DATABASES**9**

Cassandra: Apache Cassandra Introduction - Features of Cassandra - CQL Data types, CQLSH - Keyspaces -

CRUD (Create, Read, Update and Delete) Operations – Collections - Alter Commands - Import and Export - Querying System Tables - Practice Examples. MongoDB: Introduction - Terms Used in RDBMS and MongoDB - Data Types in MongoDB - MongoDB Query Language.

UNIT V HIVE AND PIG

9

Hive: Introduction to Hive - Hive Architecture - Hive Data Types - Hive File Format - Hive Query Language (HQL) - RCFile Implementation – SerDe - User-defined Function (UDF).

Pig: Introduction to Pig - The Anatomy of Pig - Pig on Hadoop - Pig Philosophy - Use Case for Pig: ETL Processing - Pig Latin Overview - Data Types in Pig - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions (UDF) - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig, Pig versus Hive.

TOTAL: 45 Hours

TEXT BOOK

1. Seema Acharya, Subhashini Chellapan, "Big Data and Analytics", 2nd edition, Wiley, 2020.

REFERENCES

1. Hadoop in Practice, Alex Holmes, Manning Publications Co., September 2014, Second Edition, 2014
2. Programming Pig, Alan Gates, O'Reilly, Kindle Publication
3. Programming Hive, Dean Wampler, O'Reilly, Kindle Publication

COURSE OUTCOMES

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

- Identify the suitable cloud computing model and services for the given application
- Understand the role of virtualization in cloud computing
- Deploy private and public cloud in real-time environment
- Analyze various threats and risks associated with cloud security
- Evaluate the challenges involved in migrating to cloud

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak																
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)															
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CO3	3	2	3	3	3	2	2	3	3	3	2	3	3	3	3	
CO4	3	3	3	3	3	2	2	3	3	2	2	3	3	2	2	
CO5	3	3	2	3	3	3	3	3	2	3	3	3	3	2	2	

UNIT I OVERVIEW OF CLOUD COMPUTING**8**

Brief history and evolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing - Why Cloud Computing, Cloud service models (IaaS, PaaS & SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing - Introduction to AWS Public Cloud Vendor.

UNIT II VIRTUALIZATION**8**

Basics of virtualization, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing - Container and Container Orchestration in Virtualization – Overview on Docker – Kubernetes.

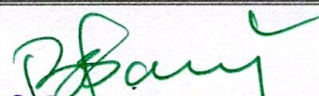
UNIT III WORKING WITH PRIVATE AND PUBLIC CLOUDS**10**

Private Cloud Definition - Characteristics of Private Cloud - Private Cloud deployment models, Private Cloud Vendors – CloudStack - Eucalyptus and Microsoft Private Cloud – Benefits and Challenges - Private Cloud implementation in Amazon EC2 service

What is Public Cloud - Why Public Cloud - When to opt for Public Cloud - Public Cloud Service Models and Public Cloud Vendors and offerings (IaaS, PaaS, SaaS) - Demonstrating public cloud with AWS - Introduction to EC2 and Storage services of AWS - Private vs. Public Cloud – When to choose.

UNIT IV OVERVIEW OF CLOUD SECURITY**10**

Explain the security concerns in Traditional IT - Introduce challenges in Cloud Computing in terms of


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Application Security - Server Security and Network Security - Security reference model - Abuse and Nefarious Use of Cloud Computing - Insecure Interfaces and APIs - Malicious Insiders - Shared Technology Issues - Data Loss or Leakage - Account or Service Hijacking - Unknown Risk Profile - Shared security model between vendor and customer in IAAS/PAAS/SAAS - Implementing security in AWS.

UNIT V FUTURE DIRECTIONS IN CLOUD COMPUTING

9

When and not to migrate to Cloud - Migration paths for cloud - Selection criteria for cloud deployment - Issues/risks in cloud computing - Future technology trends in Cloud Computing – Overview on osmotic computing.

Total: 45 hours

TEXT BOOKS

1. Cloud Computing: Principles and paradigms By Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, 2011

REFERENCES

9. Cloud computing: Implementation, management and security By Rittinghouse, John, W., CRC Press,2009
10. Cloud Computing Bible, By Barrie Sosinsky, Wiley, 2011
11. Cloud Computing and Virtualization, Dac-Nhuong Le, Raghvendra Kumar, John Wiley & Sons, 2018
12. Cloud Computing Architected: Solution Design Handbook by Rhoton, John,2013
13. Cloud Security, A comprehensive Guide to Secure Cloud Computing by Krutz, Ronald L.; Vines, Russell Dean, Wiley,2010

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Describe green computing practices to minimize negative impacts on the environment.
- Enhance the skill in energy saving practices in their use of hardware.
- Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.
- Understand the ways to minimize equipment disposal requirements.
- Apply green computing in real time

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	3	3	3	2	3	3	1	2	3	3	2	3	3	3
CO 2	2	3	3	3	3	2	2	1	2	3	3	3	3	3	3
CO 3	3	2	3	3	3	2	2	1	2	3	2	3	3	3	3
CO 4	3	3	3	3	3	2	2	1	2	2	2	3	3	2	2
CO 5	3	3	2	3	3	3	3	1	2	3	3	3	3	2	2

UNIT I FUNDAMENTALS

9

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II GREEN ASSETS AND MODELING

9

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT III GRID FRAMEWORK

9

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT IV GREEN COMPLIANCE

9

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V CASE STUDIES

9

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TOTAL: 45 hours

TEXT BOOKS:


1. Wu Chun Feng, The Green Computing Book: Tackling Energy Efficiency at Large Scale, CRC Press, Sep 2020.
2. Bud E Smith GreenComputingTools and Techniques for Saving Energy, Money, and ResourcesCRC Press, Sep 2018
3. Sourav Banerjee, ChinmayChakraborty, KousikDasguptaGreen Computing and Predictive Analytics for Healthcare, CRC Press, Dec 2020


REFERENCES:

1. Asis Kumar Tripathy, Chiranji Lal Chowdhary, Mahasweta Sarkar, Sanjaya Kumar Panda “Cognitive Computing Using GreenTechnologies Modeling Techniques and Applications, CRC Press, Feb 2021
2. Wu Chun Feng (editor), Green computing: Large Scale energy efficiency, CRC Press, 2020
3. Woody Leonhard, Katherine Murray, Green Home computing for dummies, August 2012.
4. Alin Gales, Michael Schaefer, Mike Ebbers, Green Data Center: steps for the Journey, Shroff/IBM rebook, 2011.
5. Carl speshocky, Empowering Green Initiatives with IT, John Wiley and Sons, 2010.

U19BM1001		HOSPITAL MANAGEMENT											L	T	P	C
													3	0	0	3
COURSE OUTCOMES																
On successful completion of this course, the student will be able to																
CO1	•	Describe the basics of Hospital Management.														
CO2	•	Illustrate the knowledge of Human resource management and marketing in hospitals.														
CO3	•	Apply various Quantitative methods in healthcare management.														
CO4	•	Amalgamate their knowledge in Hospital information system and supportive services.														
CO5	•	Explain the quality and safety aspects in Hospital.														
CO/PO, PSO Mapping																
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak																
Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)																
CO's		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1	1	-	-	2	1	2	2	1	2	1	-	2	1
CO2		2	1	1	-	-	2	1	2	3	1	2	1	-	2	1
CO3		2	1	1	-	-	2	1	2	3	1	1	1	-	2	1
CO4		2	1	1	-	-	2	1	2	2	1	1	1	-	2	1
CO5		2	1	1	-	-	2	1	2	2	1	1	1	-	2	1
UNIT I INTRODUCTION TO HOSPITAL ADMINISTRATION 9																
Distinction between Hospital and Industry, Challenges in Hospital Administration, Hospital Planning, Equipment Planning, Functional Planning, Current Issues in Hospital Management, Role of Manager, Leadership, Motivation, Organizational behaviour, Strategic planning, Ethics and Law, Fraud and abuse.																
UNIT II HUMAN RESOURCE MANAGEMENT AND MARKETING 9																
Principles of HRM, Functions of HRM, Profile of HRD Manager, Tools of HRD, Human Resource Inventory, Manpower Planning. Different Departments of Hospital, Recruitment, Selection, Training Guidelines, Methods of Training, Leadership grooming and Training, Promotion, Transfer.																
UNIT III QUANTITATIVE METHODS IN HEALTHCARE MANAGEMENT 9																
Introduction to quantitative decision-making methods in healthcare management, Forecasting, Decision making in healthcare facilities, Facility location, Facility layout, Reengineering, Staffing, Scheduling, Productivity, Resource allocation, Supply chain and inventory management, Quality Control, Project Management, Queuing models and capacity planning.																

UNIT IV	HOSPITAL INFORMATION SYSTEM AND SUPPORTIVE SERVICES	9
Clinical Information Systems, Administrative Information Systems, Support Service Technical Information Systems, Medical Records Department, Central Sterilization and Supply Department – Pharmacy, Food Services, Laundry Services, Telemedicine.		
UNIT V	QUALITY AND SAFETY ASPECTS IN HOSPITAL MANAGEMENT	9
Quality system, Elements, implementation of quality system, Documentation, Quality auditing, International Standards ISO 9000 – 9004. Features of ISO 9001, ISO 14000, Environment Management Systems. NABA, JCI, NABL. Security, Loss Prevention, Fire Safety, Alarm System, Safety Rules.		
TOTAL : 45 Hours		
TEXTBOOKS:		
1.	R.C. Goyal, Hospital Administration and Human Resource Management, PHI, 4th Edition, 2006.	
2.	G.D. Kunders, Hospitals – Facilities Planning and Management, TMH, New Delhi, 5th Reprint, 2007.	
REFERENCES:		
1.	Sharon B. Buchbinder and Nancy H. Shanks, Introduction to Healthcare Management, Jones and Bartlett Learning, 2017	
2.	Blane, David, Brunner, Health and SOCIAL Organization: Towards a Health Policy for the 21st Century, Eric Calrendon Press, 2002.	
3.	Yasar A. Ozcan, Quantitative Methods in Healthcare management, Jossey Bass- John Wiley and Sons, 2009.	


COORDINATOR
K.MANIKANDAN
 Asst. Prof /BME


CHAIRMAN
BoS-BME

Dr.S.PRABAKAR, M.E., Ph.D.,
 Professor and Head
 Department of Biomedical Engineering
 Sona College of Technology, Salem-5

PREAMBLE**To****Municipal Solid Waste Management**


Solid wastes represent one of the main environmental problems in India that needs to be dealt with. In order to minimize environmental impacts and pave the way for a sustainable development, integrated and specific actions need to be adopted and implemented. Due to rapid increase in the production and consumption processes, societies generate as well as reject solid materials regularly from various sectors – agricultural, commercial, domestic, industrial and institutional. The present course covers evaluation on the type and nature of wastes, estimation of total volumes and assessment of handling, storage, transportation and disposal methods to be adopted and the potential environmental impacts.

The overall objectives of the course:

- To assess the activities involved for the proposed and determine the type, nature and estimated volumes of waste to be generated.
- To identify any potential environmental impacts from the generation of waste at the site;
- To recommend appropriate waste handling and disposal measures / routings in accordance with the current legislative and administrative requirements; and
- To categories waste material where practicable (inert material / waste fractions) for disposal considerations i.e. public filling areas / landfill.

COURSE CODE	COURSE NAME												L	T	P	C
U19CE1002	MUNICIPAL SOLID WASTE MANAGEMENT												3	0	0	3
Course Objective (s): The Purpose of learning this course is to:																
1.	Provide a broader understanding on various aspects of sources and solid waste management.															
2.	Impart the basic knowledge in the methods and processing of on-site storage.															
3.	Provide the basic knowledge of types of collection vehicles and transfer stations.															
4.	Aware the students about different techniques involved in off-site processing.															
5.	Awareness to be given on disposing the wastes using sanitary landfills.															
Course Outcome (s) (COs): At the end of this course, the students will be able to:																
CO1	Identify the sources, types and characteristics of solid wastes. (K1)															
CO2	Choose the on-site storage methods and processing techniques. (K2)															
CO3	Summarize the methods of collection and its components. (K2)															
CO4	Outline the off-site processing techniques & equipment's and resource recovery from solid wastes. (K3)															
CO5	Evaluate the processing techniques and disposal methods for managing the municipal solid wastes. (K4)															
Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:																
CO – PO Mapping																
Cos	Pos												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	POS		
CO1	3	2	-	-	-	2	2	1	-	-	-	-	2	-		
CO2	3	-	-	-	-	3	2	-	-	-	-	-	2	-		
CO3	3	-	-	-	-	2	2	1	-	-	-	3	2	-		
CO4	3	-	-	-	3	3	2	1	-	-	-	3	2	3		
CO5	3	3	3	-	3	3	2	1	-	-	-	3	2	3		
CO (Avg)	3	1	0.6	-	1.2	2.6	2	0.8	-	-	-	1.8	2	1.2		

Correlation Level:		1:Slight (Low)	2:Moderate (Medium)	3:Substantial (High)
UNIT-I	SOURCES AND TYPES			9 Hours
Sources and types of solid wastes - Quantity - factors affecting generation of solid wastes; characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - public health effects. Principle of solid waste management –IOT Applications in Waste management; Public awareness; Role of NGOs; Solid waste management rules 2016 - Construction and demolition Wastes				
UNIT-II	ON-SITE STORAGE AND PROCESSING			9 Hours
On-site storage methods - Materials used for containers - on-site segregation of solid wastes - public health & economic aspects of storage - options under Indian conditions - Critical evaluation of options.				
UNIT-III	COLLECTION AND TRANSFER			9 Hours
Methods of Residential and commercial waste collection - Collection vehicles - Manpower- collection routes - Analysis of collection systems; Transfer stations - Selection of location, operation & maintenance; options under Indian conditions - Field problems- solving				
UNIT-IV	OFF-SITE PROCESSING			9 Hours
Processing techniques and equipment; Resource recovery from solid wastes - Composting, incineration, Pyrolysis - Options under Indian conditions - Case studies.				
UNIT-V	DISPOSAL			9 Hours
Dumping of solid waste; Sanitary landfills - Site selection, design and operation of sanitary landfills -Leachate collection and treatment, Land fill bio reactor, Landfill capping, Landfill mining.				
				TOTAL: 45 Hours
TEXT BOOKS:				
1.	George Tchobanoglous, “Integrated Solid Waste Management”, McGraw-Hill Publishers,2003.			
2.	Vesilind P.A. and Rimer A.E, “Unit Operations in Resource Recovery Engineering”, Prentice Hall, Inc., 1981			
REFERENCES:				
1.	Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.			
2.	Landreth R.E, and P.A and Rebers, “Municipal Solid Wastes –problems and Solutions”, Lewis Publishers, 2000.			
3.	Ramachandra T.V, “Management of Municipal Solid Waste”, TERI press, New Delhi, 2009.			
4.	Paul T Willams, “Waste Treatment and Disposal”, John Wiley and Sons, 2000			
5.	http://nptel.iitm.ac.in			


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 Dean (R&D) of Civil Engg.
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PREAMBLE**To
Energy Efficiency and Green Building**

- Green building, or sustainable design, is the practice of increasing the efficiency with which buildings and their sites use energy, water, and materials, and of reducing impacts on human health and the environment for the entire lifecycle of a building.
- A sustainable building or green building is an outcome of a design philosophy which focuses on increasing the efficiency of resource use-energy, water, and materials-while reducing building impacts on human health and the environment during the building's lifecycle, through better siting, design and construction.
- Solar water heating further reduces energy costs. Onsite generation of renewable energy through solar power, wind power, hydro power, or biomass can significantly reduce the environmental impact of the building. Power generation is generally the most expensive feature to add to a building.

Green buildings are designed in such a way to reduce overall impact on environment and human health by:

- Reducing trash, pollution and degradation of environment.
- Efficiently using energy, water and other resources.
- Protecting occupant health and improving productivity.

COURSE CODE	COURSE NAME												L	T	P	C
U19CE1003	ENERGY EFFICIENCY AND GREEN BUILDING												3	0	0	3
Course Objective (s): The Purpose of learning this course is to:																
1.	To describe the importance of energy resources, its availability and conservation for sustainability goals.															
2.	To study and identify the methods adopted to make the building as energy efficient.															
3.	To gain knowledge about use of construction materials based on embodied energy values															
4.	To study about different green building rating systems with real time examples.															
5.	To create awareness about clean development mechanism and the role of UNFCCC in sustainability															
Course Outcome (s) (COs): At the end of this course, the students will be able to:																
CO1	Acquire the basics understanding of green building concept and associated resources. (K1)															
CO2	Analyze the various methods to design green building parameters. (K3)															
CO3	Understand the availability of construction materials for energy efficient construction (K4)															
CO4	Aware about the various green building rating systems prevail in the country (K3)															
CO5	Understand the role of UNFCCC and know about clean development mechanism (K2)															
Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:																
CO – PO Mapping																
COs	Pos												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	POS		
CO1	3	1	3	1	2	1	3	1	1	-	-	3	2	2		
CO2	3	1	3	1	2	1	3	1	1	-	-	3	2	2		
CO3	3	1	3	1	1	1	3	1	1	-	-	2	2	2		
CO4	2	2	3	1	1	1	3	2	1	-	-	2	2	1		
CO5	2	2	3	1	1	1	3	2	1	-	-	2	2	1		
CO (Avg)	2.6	1.4	3	1	1.4	1	3	1.4	1	-	-	2.4	2	1.6		
Correlation Level: 1:Slight (Low) 2:Moderate (Medium) 3:Substantial (High)																

UNIT-I	INTRODUCTION	9 Hours
Definition and concepts, Energy and water as a resource - Criticality of resources - Needs of modern living - Heat loss and heat gain in buildings- thermal comfort improvement methods - other building comforts -indoor air quality requirements - electrical energy conservation.		
UNIT-II	ENERGY EFFICIENT BUILDINGS	9 Hours
Zero Energy Building (ZEB) - Nearly Zero Energy Building (NZEB) - energy consumption - defining low energy buildings- opportunities and techniques for energy conservation in buildings - water conservation - water management system - water efficient landscaping - green roofing - rainwater harvesting - sanitary fixtures and plumbing systems - wastewater treatment and reuse - process water strategies - adoption to sustainable resources, process and technologies- Energy Conservation Opportunities in Public and Private Buildings.		
UNIT-III	CONSTRUCTION MATERIALS AND PRACTICES	9 Hours
Construction materials - Embodied energy, carbon content, and emission of CO ₂ , SO ₂ and NO _x of building materials, elements and construction process- Current practice and low environmental impact alternatives.		
UNIT-IV	BUILDING ASSESSMENT SCHEMES	9 Hours
Energy efficiency ratings & ECBC - 2007 - Various energy efficiency rating systems for buildings - LEED, BEE, & GRIHA - case studies.		
UNIT-V	CLEAN DEVELOPMENT MECHANISM	9 Hours
Clean Development Mechanism - CDM Benefits for energy conservation methodology and procedure - Eligibility Criteria - UNFCCC - role of UNFCCC and Government of India.		
		TOTAL: 45 Hours
TEXT BOOKS:		
1.	Sustainable Building, Design Manual: Published by The Energy and Resources Institute, Darbari Seth block, IHC Complex, Lodhi Road, New Delhi-110003.	
2.	KILBERT, Charles , (2008) Sustainable construction : Green Building Design and Delivery John Wiley and Sons..	
3.	BROWN, G.Z. and DEKAY, Mark, 2001. Sun, Wind & Light - Architectural Design Strategies, Second Edition , John Wiley & sons, Inc.	
REFERENCES:		
1.	ECBC Code 2007 (Edition 2008) published by Bureau of Energy Efficiency, New Delhi	
2.	Bureau of Energy Efficiency Publications - rating System, TERI PUBLICATIONS .	
3.	GRIHA Rating System, LEED Publications	


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Course Outcomes

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

- 1) Analyze the 1G and 2G Technologies.
- 2) Explain the 2.5G evolutions
- 3) Analyze the principles of 3G and UMTS
- 4) Analyze the evolutions of 4G.
- 5) Summarize the various wireless security applications and solve the mobile phone faults.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3		1		1	1	3		
CO2	3	3	3	3	3	3		1		1	1	3		
CO3	3	3	3	3	3	3		1		1	1	3		
CO4	3	3	3	3	3	3		1		1	1	3		
CO5	3	3	3	3	3	3		1		1	1	3		

Unit I 1G and 2G

9

First Generation (1G): 1G Systems – General 1G System Architecture – Generic MTSSO Configuration – Generic Cell Site Configuration – Call Setup Scenarios – Handoff – Frequency Reuse – Spectrum Allocation – Channel Band Plan

Second generation (2G): Enhancements over 1G Systems – Integration with Existing 1G Systems – GSM - iDEN – CDPD

Unit II 2.5G Generation

9

Enhancements over 2G – Technology Platforms – General Packet Radio Service (GPRS) – Enhanced Data Rates for Global Evolution (EDGE) – High-Speed Circuit Switched Data (HSCSD) – CDMA2000 (1XRTT) – WAP-Migration Path from 2G to 2.5G to 3G..

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Unit III 3G Generation

9

Introduction – Universal Mobile Telecommunications Service (UMTS), UMTS Basics, The UTRAN Architecture, Handover, UMTS Services – The UMTS Air Interface – Overview of the 3GPP Network Architecture – Overview CDMA2000 – Commonality Between WCDMA/CDMA2000/CDM

Unit IV 4G and Beyond

9

Introduction to LTE - Network architectures – EPC – E-UTRAN architecture – Mobility management – Resource management – Services – Channel – logical and transport channel mapping – downlink/uplink data transfer – MAC control element – PDU packet formats – scheduling services – random access procedure – Objectives of 5G-Architecture – Features and benefits.

Unit V Wireless Security and Mobile Phone service

9

Introduction – Fingerprint – Classification of major security attacks against RFID systems – GSM Security – Barcode scanner technology features and applications – QR code – BAR code – OTP – AirDrop.
Mobile phone Service: Parts in the mobile phones -Mobile phones assembling and disassembling –motherboard - Mobile Operating Systems - Fault finding - Advanced troubleshooting techniques.

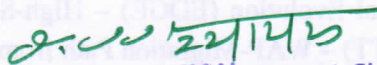
TOTAL : 45 HOURS

Text Book

- 1) Clint Smith,P.E, Dannel Collins, “3G Wireless Networks” 2nd edition, Tata McGraw-Hill, 2008.
- 2) Vijay K.Garg, “Wireless Network Evolution- 2G & 3G” Pearson, 2013.

References

- 1) T.S Rapp port, “Wireless Communications” Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint, 2013.
- 2) JochenH.Schiller, “Mobile Communications”, 2/e, Pearson, 2014
- 3) SassanAhmadi, “LTE-Advanced – A practical systems approach to understanding the 3GPP LTE Releases 10 and 11 radio access technologies”, Elsevier, 2014


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COURSE OUTCOMES

At the end of the course the students will be able to

1. Assess role of energy in global economic development.
2. Explain methodology of energy audit and concept of instruments used.
3. Discuss various lamps and design energy efficient illumination schemes.
4. Apply energy conservation concepts in buildings.
5. Identify the energy conserving opportunities in utilities.

CO / PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3		2			2	3	3	3	2
CO2	2	2	3	3	3				2			3	3	2
CO3	2	2	3	3	3	3			3		2	3	3	2
CO4	2	2	3	3	3	2		3				3	3	2
CO5	2	2	3	3	3		3			3		3	3	2

UNIT- I ENERGY SCENARIO AND BASICS

9

Classification of Energy – Purchasing Power Parity – Energy Security – Strategy to meet future energy requirements – Objectives and features for electricity act 2003 – Energy efficiency standards and labeling – Study of Global and Indian primary energy reserves – Study of energy scenario for India – Energy and environment – Global environmental issues – Types of Energy – Electrical and Thermal energy basics – Energy units and conversions.

UNIT- II ENERGY MANAGEMENT AND AUDIT

9

Definition and objectives of energy management and audit – Need for energy audit – Types of energy audit – Methodology for conducting detailed energy audit – ENCON opportunities and measures – Energy audit report. Energy costs – Benchmarking – Energy performance – Fuel and Energy substitution – Instruments and metering for energy audit – Basic principles, components of material and energy balance – Sankey diagram – Financial analysis terms – Payback period, ROI, NPV, IRR.

UNIT- III LIGHTING SYSTEMS

9

Introduction – Terms in Lighting and Illumination – Light sources - Lamp types – Arc Lamps, Vapour lamps = Incandescent lamp, Fluorescent lamp = Energy saving lamps = CFL, LED = Lighting design for interiors – Indoor and outdoor lighting schemes – Energy saving opportunities – Energy efficient lighting controls.

UNIT- IV ENERGY CONSERVATION IN BUILDINGS

9

Energy conservation building code (ECBC) – Compliance approaches – ECBC guidelines on Building envelope, HVAC system, Service hot water, Water pumps – Energy consumption in Escalators and Elevators – Building Energy Management Systems – Star ratings – Energy Efficiency Measures in AC and Lighting system.

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UNIT-V ENERGY EFFICIENT OPPORTUNITIES IN UTILITIES

9

Introduction to Compressed air system components – Heat transfer loops in refrigeration systems – Standards and labelling of room air conditioners – Introduction to Fans, Blowers and Compressors – Types of pumps, Pump curves – Efficient operation of pumps – Components of cooling towers and its efficient operation - Introduction to DG set system.

Energy Efficiency and energy savings in Compressed Air System, HVAC system, Fans and Blowers, Pumping system, Cooling towers, and DG sets.

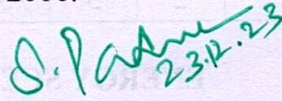
Lecture: 45; Tutorial: 00; Total: 45

TEXT BOOKS:

1. "General Aspects of Energy Management and Energy Audit", Bureau of Energy Efficiency, Fourth Edition, 2015.
2. "Energy Efficiency in Electrical Utilities", Bureau of Energy Efficiency, Fourth Edition, 2015.

REFERENCE BOOKS:

1. Chakrabarti A, "Energy Engineering and Management", PHI, 2011.
2. Murphy W R, McKay G, "Energy management", Elsevier, 2009.
3. Rajput R K, "Utilization of Electrical Power", Lakshmi Publications, 2006.

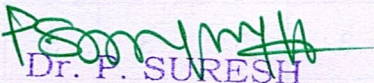

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Department of Mechatronics Engineering

Open Elective

U19MC1004		FUNDAMENTALS OF ROBOTICS								L	T	P	C	
										3	0	0	3	
Course Outcomes														
After successful completion of this course, the students should be able to														
CO1:	Understand the basic robotic concepts													
CO2:	Select the suitable drive system for robot application													
CO3:	Select the suitable sensors and grippers for the respective application													
CO4:	Develop VAL Programming for simple applications													
CO5:	Illustrate the robotic application in various sectors													
Pre-requisite														
NIL														
CO/PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2			3	2		3		3	3	3	3
CO2	2	2	2		3				3		2	3	2	3
CO3	3	2	2		3				3		2	3	3	3
CO4	3	3	3	3	3				3		2	3	3	2
CO5	3	3	3	3	3	3	3		3			2	3	3
Course Assessment methods														
Direct							Indirect							
Internal test I (8) Internal test II (8) Internal test III (8) Assignment/seminar/Quiz (5)							Online test (6) Attendance (5) End semester Examination (60) Course end survey							
Unit 01: INTRODUCTION TO ROBOTICS												9 Hours		
Introduction to Robotics – History of Robotics – Laws of Robotics - Anatomy of a Robot – Classification of Robots – Robot Configurations - Robot subsystems: Motion subsystem, Recognition subsystem, Control subsystem – Robot Links – Joints in robot –Robot Specifications.														

Unit 02: ROBOT MOTIONS AND DRIVE SYSTEMS			9 Hours
Degrees of freedom – DOF associated with arm and body - DOF associated with wrist –Joint Notation scheme- Robot Kinematics – Robot Drive systems – Hydraulic Actuators – Pneumatic actuators – Electrical actuators: Stepper motors, DC motors, Servomotor.			
Unit 03: ROBOT SENSORS AND END EFFECTORS			9 Hours
Classification of Robotic sensors and their functions – Tactile sensors – Inductive Proximity sensor – Hall effect sensor – Range sensor –Force ant Torque sensors- Types of end effectors – Mechanical grippers – Vacuum cups – Magnetic grippers – Adhesive grippers – Tools as end effectors.			
Unit 04: ROBOT PROGRAMMING			9 Hours
Methods of Robot Programming: Lead through methods, Textual robot Languages – Robot language structure – First generation Languages – Second generation Languages – VAL Programming – Simple Programming examples.			
Unit 05: ROBOT APPLICATIONS			9 Hours
Robotics Applications in Manufacturing: Welding Robot, AGVs– Healthcare: Surgery Robot, Therapeutic Robot – Agriculture: Crop Harvesting & Fruit Picking Robot – Defence & Space: Exoskeleton Robot, Telerobotics.			
Theory: 45 Hrs	Tutorial: --	Practical: --	Total Hours: 45 Hrs
TEXT BOOKS			
1.	M.P.Groover, M.Weiss,R.N. Nagal,N.G.Odrey, "Industrial Robotics - Technology, programming and Applications" Tata McGraw-Hill Publication, 2012.		
REFERENCES			
1.	Richard D.Klafter, "Robotics Engineering" PHI Learning Private Limited, 2009.		
2.	Ganesh S.Hedge, "A text book in Industrial Robotics", Laxmi Publications, 2006.		
3.	S K Saha, "Introduction to Robotics", Tata McGraw-Hill Publication, 2012.		
4.	Sathya Ranjan Deb, "Robotics Technology & flexible Automation" Second edition, Tata McGraw-Hill Publication, 2009.		


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COURSE CODE U19ME1004

L T P C

COURSE NAME RENEWABLE ENERGY SOURCES

3 - - 3

Prerequisites- subject: Environmental Sciences.**Course Outcomes**

Upon completion of this course the students will be able to

- CO1** Discuss the power demand scenario in world level and impact of various renewable energy sources in satisfying power demand.
- CO2** Explain the different components and the principle of operation and the application of solar PV system and Bio Mass power generation system.
- CO3** Outline in the components and to find the suitability based on the performance of wind energy conversion system, geothermal and hydel power system.
- CO4** Describe the components of tidal power generation scheme and wave energy scheme and to discuss the performance of two schemes.
- CO5** Compare and contrast the various components and methods of Ocean Energy Conversion Systems.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO - 1	3	3	3	-	3	3	3	2	3	3	2	3	3	3
CO - 2	3	-	3	3	3	3	3	-	3	3	3	3	3	3
CO - 3	3	3	3	2	3	3	3	-	3	3	3	3	3	3
CO - 4	3	3	3	2	3	3	3	-	3	3	2	3	3	3
CO - 5	3	2	3	3	3	3	3	2	3	3	2	3	3	3

Unit I INTRODUCTION

L 9 T 0

World energy use – reserves of energy resources – energy cycle of the earth – environmental aspects of energy Utilization – renewable energy resources and their importance.

Unit II SOLAR & BIO ENERGY

L 9 T 0

Introduction – extra-terrestrial solar radiation – radiation at ground level – collectors – solar cells – applications of solar energy – Biomass Energy – Introduction – Biomass Conversion – Biogas Production – Ethanol Production – Pyrolysis and Gasification – Direct Combustion – Applications.

Unit III GEO THERMAL AND HYDRO ENERGY SOURCES

L 9 T 0

Geothermal energy – types of geothermal energy sites, site selection, and geothermal power plants, Hydro energy – Feasibility of small, mini and micro hydro plants: scheme, layout and economics.

Unit IV WIND AND TIDAL ENERGY

L 9 T 0

Introduction – Wind Energy – Wind speed and power relation – Power extracted from wind – wind distribution and wind speed predictions – types of Wind power systems.

Introduction – origin of tides – power generation schemes – Wave Energy – basic theory – wave power Devices.

Unit V OTHER RENEWABLE ENERGY SOURCES

L 9 T 0


Introduction – Open and Closed OTEC cycles – Ocean Currents – Salinity Gradient Devices – Potential impacts of harnessing the different renewable energy resources.

Total Number of hours: 45**Learning Resources****Text Books**

1. Twidell John; Weir, Tony, "Renewable energy resources", Taylor & Francis, 2010
2. Godfrey Boyle, "Renewable energy – power for a sustainable future", Oxford University Press, 2010
3. Kothari DP, Singal KC and Rakesh Ranjan, 'Renewable Energy Sources and Emerging Technologies' PHI Learning Pvt. Ltd.2011.
4. S.A. Abbasi and Naseema Abbasi, "Renewable energy sources and their environmental impact", Prentice- Hall of India, 2001.

Reference Books

1. T.N.Veziroglu, Alternative Energy Sources, Vol 5 and 6, McGraw Hill, 1978.
2. G D Rai, "Non-conventional sources of energy", Khanna Publishers, 2002.
3. G D Rai, "Solar energy utilization", Khanna Publishers, 2005.
4. MukundR.Patel, "Wind and Solar Power Systems", CRC Press, Taylor and Francis, 2005.
5. Yogi Goswami, 'Principles of Solar Engineering' CRC Press, 2015, ISBN 10: 1466563788



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COURSE CODE U19ME1002

L T P C

COURSE NAME INDUSTRIAL SAFETY

3 - - 3

Course Outcomes

Upon completion of this course the students will be able to

- CO1** Summarize various legal provisions available in safety regulation.
- CO2** Analyze industrial environment hygiene and develop precautionary measure to avert occupational diseases.
- CO3** Demonstrate the uses of different grades of fire protection systems related with different classes of fire.
- CO4** Develop Agronomical study of different work environment in industries.
- CO5** Discuss the importance of safety training and its impact on shop floor of factories.

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO - 1	3	-	-	-	1	3	3	3	2	2	3	3	2	2
CO - 2	3	2	2	1	3	3	3	3	2	2	-	2	2	3
CO - 3	2	3	2	3	3	3	3	3	3	3	3	2	2	3
CO - 4	2	1	3	3	3	3	2	3	1	2	-	2	3	3
CO - 5	1	3	3	3	-	3	-	3	3	3	2	3	2	2

Unit I BASICS OF SAFETY ENGINEERING & ACTS

L 9 T 0

Evolution of modern safety concept –safety performance monitoring. Acts – factories act – 1948 – Statutory authorities – inspecting staff – Tamilnadu Factories Rules 1950 under Safety and health – environment act – 1986 – Air act 1981, water act 1974 – other acts. Safety in industries – General safety concepts, machine guarding, hazards in metal removing process, welding process, cold and hot working process.

Unit II OCCUPATIONAL HEALTH AND INDUSTRIAL HYGIENE

L 9 T 0

(Basic concepts, related hazards and exposure limits)

Physical Hazards – Noise, heat, radiation, vibration, recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases. Biological and Ergonomical Hazards-Basic concepts. Occupational Health-Concept and spectrum of health – functional units and activities of occupational health services, pre-employment and post-employment medical examinations – occupational related diseases, levels of prevention of diseases, notifiable occupational diseases. Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, Preliminary Hazard Analysis (PHA), human error analysis, hazard operability studies (HAZOP), safety warning systems.

Unit III FIRE ENGINEERING AND EXPLOSIVE CONTROL

L 9 T 0

Fire properties of solid, liquid and gases – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers – Principles of explosion – Explosion Protection – Electrical Safety. Electrical Hazards – Primary and Secondary hazards – concept of earthing – protection systems – fuses, circuit breakers and over load relays – first aid cardiopulmonary resuscitation techniques.

Unit IV ERGONOMICS

L 9 T 0

Introduction to ergonomics: The focus of ergonomics, ergonomics and its areas of application in the work system, modern ergonomics, and future directions for ergonomics. Anatomy, Posture and Body Mechanics: anatomy of the spine and pelvis related to posture, posture stability and posture adaptation, low back pain, risk factors for musculoskeletal disorders in the workplace, effectiveness and cost effectiveness. Anthropometry and its uses in ergonomics, Applications of human factors engineering, man as a sensor, man as information processor, man as controller – Ergonomics in IT industries.

Unit V SAFETY EDUCATION AND TRAINING

L 9 T 0


Importance of training – identification of training needs – training methods – programs, seminars, conferences, competitions – motivation – communication – role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety Training.

Total Number of hours: 45**Learning Resources****Text Books**

1. Krishnan N.V., "Safety Management in Industry", Jaico Publishing House, Bombay, 1997.
2. Hand book of "Occupational Safety and Health", National Safety Council, Chicago, 1982.

Reference Books

1. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986.
2. Guidelines for Hazard Evaluation Procedures Centre for Chemical Process Safety, AICHE 1992.
3. The factories Act 1948, Madras Book Agency, Chennai, 2000.
4. Introduction to Ergonomics, R.S. Bridger, Taylor & Francis.



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COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Explain the basics of garment technology.
2. Explain in detail about the various seams, stitches, needle type, sewing thread and types of sewing machines.
3. Explain in detail about the various garment accessories.
4. Explain the sewing quality parameters and method of garment laundering.
5. Discuss the quality standards of apparel industry and finishing of garments.

CO/PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2						3	3	2
CO2	3	3	3	3	3	3	1					3	3	2
CO3	2	3	3	3	3	3	3					3	3	3
CO4	3	3	3	3	3	3	3	3				3	3	2
CO5	2	3	2	3	3		3	2				3	3	2

UNIT-I Basics of apparel industry - lay out, process sequence 9

Introduction: Apparel industry in world, types of workers in apparel industry, typical layout of apparel industry.

Garment Production Sequence: Fabric selection, pattern making, grading, marker planning, spreading, cutting and sewing, finishing and packing.

UNIT II Seams, Stitches, Needle and Sewing Threads, Types of sewing Machines 9

Seam and Stitches: Classification of seams and stitches, single needle lock stitch machine, parts and functions.

Needle and Sewing Thread: Needle, functions, special needles, needle size, numbering, needlepoint, sewing thread construction, material, thread size, sewing thread packages.

Basics of sewing machines: Single needle Lock stitch, Double needle lock stitch, Over lock, Flat lock, Feed of the arm, Button Attaching, Button hole machine.

Unit III Garment Accessories 9

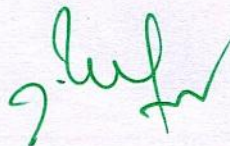
Garment add-on: Labels, linings, interlinings, wadding, lace, braid, elastic, hook and loop fastening, shoulder pads, eyelets and laces, zip fasteners, buttons, Tapes, Tags.

UNIT IV Overview of garment making and care labelling of garment 9

Sewing Process: Garment basic components and assembly process.

Alternative sewing process: Fusing, welding, adhesive, seamless garments, moulding, robotics in sewing.

Basic sizes of mens wear, women's wear, childrens wear and its description.



Types of labels: Size label, brand label, wash care label, designer label.

UNIT V Defects in garment, pressing and Packing

9

Defects: Common defects in woven fabric, knitted fabric and garment.

Garment pressing: Pressing types and pressing equipments.

Packing: Types of packing and different types of packing materials.

TEXT BOOKS

1. Rajkishore Nayak Rajiv Padhye, "**Garment Manufacturing Technology**", woodhead publication, 2015.
2. Ganesan, P., Gopalakrishnan, D., Karthik, T, "**Apparel manufacturing technology**", CRC Publication, 2016.
3. Gerry Cooklin, Steven George Hayes, John McLoughlin, Dorothy Fairclough. "**Cooklin's Garment Technology for Fashion Designers**", John Wiley & Sons, 2011.

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REFERENCE

1. EIRI Consultants and Engineers, "**Hand book of garment manufacturing technology**", 2017.
2. Janace E. Bubonia, "**Apparel production terms and processes**", 2017.
3. Harold Carr, Barbara Latham, "**The Technology of Clothing Manufacture**", Wiley, 1994.

COURSE OUTCOMES

At the end of this course the students will be able to,

1. Acquire the knowledge for establishment of an enterprise and management,
2. Derive innovative ideas, right approach to the problem and arrive solution for problem with IPR and its legal aspects.
3. Prepare the project report preparation and assessment of Business.
4. Acquire the knowledge on costing, Techno-economic aspects, find out the sources of finance and opportunities in business.
5. Identify the support system for Entrepreneurs by Government and venture capitals.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			3			3	3		3	3	3	3		3
CO2			3			3	3	3	3	3	3	3		3
CO3			3			3	3	3	3	3	3	3		3
CO4			3			3	3	3	3	3	3	3		3
CO5			3			3	3	3	3	3	3	3		3

UNIT I ENTREPRENEURSHIP & MOTIVATION 9
 Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur
 Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth. Major Motives
 Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic
 Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT II INNOVATION, CREATIVITY, DEVELOPMENT PROCESS AND LEGAL ASPECTS 9
 Innovation and Creativity- An Introduction, Innovation in Current Environment, Types of Innovation
 Sources of new Ideas, Methods of generating innovative ideas, creating problem solving, product
 planning and development process. Legal aspects of business (IPR, Labor law).

UNIT III BUSINESS 9
 Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project
 Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business
 opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of
 Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and
 Agencies.

UNIT IV FINANCING AND ACCOUNTING 9
 Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working
 Capital, Costing, Break Even Analysis, Taxation – Income Tax, GST.

S.P. Padma
23.12.23

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UNIT V SUPPORT TO ENTREPRENEURS

9

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Lecture: 45; Tutorial: 0; Total: 45 Hrs

TEXT BOOKS:

1. Khanka. S.S., “Entrepreneurial Development” S.Chand& Co. Ltd., Ram Nagar, New Delhi, 2013. 99
2. Donald F Kuratko, “Entrepreneurship – Theory, Process and Practice”, 9 th Edition, Cengage Learning, 2014.

REFERENCES:

1. Hisrich R D, Peters M P, “Entrepreneurship” 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2 nd Edition Dream tech, 2005.
3. Rajeev Roy, "Entrepreneurship" 2 nd Edition, Oxford University Press, 2011.
4. EDII “Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development”, Institute of India, Ahmadabad, 1986.
5. Innovation and Entrepreneurship Book by Peter Drucker,
6. James Larminie and John Lowry, “Electric Vehicle Technology Explained “ John Wiley & Sons, 2003.

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Professor and Head,
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COURSE OUTCOMES

At the end of this course the students will be able to,

1. Describe the power demand scenario in world level and impact of various renewable energy sources in satisfying power demand.
2. Explain the principle of operation and the application of solar system.
3. Outline in the components and to find the suitability based on the performance of wind energy and Conversion system, biomass energy system
4. Describe the principle of operation and the application of geo thermal power tidal power generation scheme, wave energy and OTEC scheme.
5. Illustrate the emerging energy generation systems of MHD, Thermal and fuel cells applications.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2					2		2	3	3	3
CO2	3	3	3	2	1	3	3	1	2		3	3	3	3
CO3	3	3	3	2	2	3	3	1	2		3	3	3	3
CO4	3	3	3	2	2	3	3	1	2		3	3	3	3
CO5	3	3	3	2	2	3	3	1	2		3	3	3	3

UNIT I INTRODUCTION

9

World energy futures–Energy sources and their availability – Energy cycle of the earth – environmental aspects of energyutilization – Energy plantation- Renewable energy resources and their importance- Prospects of Renewable energy sources.

UNIT II SOLARENERGY SYSTEMS

9

Introduction –Solar radiation and measurements-Solar energy collectors-solar energy storage systems- Solar pond and applications- Applications of solar energy: solar pumping, solar cooking, solar distillation and solar greenhouse.

UNIT III WIND AND BIOMASS ENERGYSYSTEMS

9

Introduction – Wind Energy conversion- Wind speed and power relation – Power extracted from wind – wind distributionand wind speed predictions – types of Wind power systems.

Bio mass conversion technologies-Biogas generation-Types of biogas plants-Bio gas from plant wastes- Utilization of Bio gas and applications.

UNIT IV GEOTHERMAL, TIDAL AND OCEAN ENERGY SYSTEMS

9

Geothermal energy – Estimates of Geothermal power- site selection for geothermal power plant- Applications of Geothermal energy.

Origin of tides – Basic principle of Tidal power- Operation of a Tidal power plant. Ocean Thermal Energy conversion system- Open and closed OTEC cycles- Prospects of ocean thermal energy conversion in India.

S. Padma
23.12.23
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UNIT V EMERGING ENERGY SYSTEMS

Magneto Hydro Dynamic (MHD) Power Generation- MHD systems and its operation. Thermo Electric power generation- Basic principle- Thermo electric power generator. Thermonuclear fusion energy-Nuclear fusion and reactions- Advantages. Fuel cell- classification of fuel cells- Fuel cell based electrical power generation scheme- Applications.

Lecture: 45; Tutorial: 0; Total: 45 Hours

TEXT BOOKS:

1. Rai, G.D., "Non-Conventional Energy Sources", Khanna Publishers, Sixth Edition 2017.
2. Khan, B.H, Non- Conventional Energy Resources", Mc. Graw Hill Education Ltd, third reprint 2017.

REFERENCE BOOK

1. Rao S. Paruklekar, B.B, "Energy Technology – Non Conventional, Renewable and Conventional", Khanna Publishers, 1994.
2. F.Kreith and J.F.Kreider, "Principles of Solar Engineering", McGraw Hill.
3. T.N.Veziroglu, "Alternative Energy Sources", Vol 5 and 6, McGraw Hill.
4. MukundR.Patel, "Wind and Solar Power Systems", CRC Press LLC.

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* Professor and Head,
* Department of EEE,
Sona College of Technology
Salem-636 005, Tamil Nadu.

COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Define and discuss the fashion and related terms and reason for change in fashion and the classification
2. Describe clothing and its purpose, Role of clothing and its status.
3. Describe the selection of clothing for various age groups, Fashion apparel and wardrobe planning.
4. Explain the elements and principles of the design, with the effects in the apparel
5. Bounce out the theme and development of portfolio.

CO/PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO12	PSO1	PSO2	PSO3
CO1	3	3	3							3	3	3	3	3
CO2	3	3	3									3	3	3
CO3	3	3	3								3	3	3	3
CO4	3	3	3								3	3	3	3
CO5	3	3	3							3	3	3	3	3

UNIT I Introduction to Fashion 9
Origin of fashion - terms and definitions - reasons for change in fashion - classification of fashion – Style, Classic, FAD, Trend – theories of fashion – movement of fashion - fashion cycle.

UNIT II Introduction to Clothing 9
Understanding clothing - Purpose of clothing: protection, modesty, attraction etc - Importance of clothing - Clothing Culture, Men and Women clothing and ornamentation - Role and status of clothing - Clothing according to climatic conditions – factors to be considered in the selection of clothing

UNIT III Selection of clothes 9
Clothes for children, middle-aged and adults. Types of clothes according to different types of human figure, Different materials for different clothes, Fabrics and colours suitable for different garments.

Planning for clothing needs: Formal clothing, Clothes for parties, Clothes for sports, Casual Clothes for casualwear. **Wardrobe Planning:** Wardrobe for men and women

UNIT IV Elements and Principles of Design 9

22.12.2023

Regulations-2019


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Elements of Design: Introduction on basics Elements of design - Silhouette, Details, Texture, Color, Lines,

Principle of design: Introduction to principles of Elements of design - Proportion, Balance, Rhythm, Center of Interest, Harmony

UNIT 5 Design and Development

9

Boards: Mood board, fabric board, colour board, accessory board. Fashion illustration – head theories, Illustration techniques – strokes, hatching, shading; Colouring techniques – Medias for colouring. Portfolio presentation – styles of presentation - Fashion shows.

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Professor & Head

Department of Fashion Technology

Sona College of Technology

Salem - 686 005, Tamil Nadu

TOTAL: 45 hours

TEXT BOOKS

1. Munslow, Janine, McKelvey, Kathryn “**Fashion Design Process Innovation and Practice**”, 2nd Edition, wiley, 2012.
2. Nicola White, Ian Griffiths, “**The Fashion Business Theory, Practice, Image**”, Berg, 2000.

REFERENCE

1. Sumathi, G. J. **Elements of fashion and apparel design**. New Age International, 2007.
2. Kathryn McKelvey “**Fashion Source Book**” Balckwell Publishing New Delhi.
3. Mills, Jane, and Janet K. Smith. **Design concepts**. Fairchild Books, 1985.
4. Rasband J. **Wardrobe strategies for women**. Fairchild Publications; 2002.
5. Jarnow JA, Judelle B, Guerreiro M. **Inside the fashion business**. Wiley; 1981.

Syllabi for

**B.E/B.Tech Honours (Specialization in the
same Discipline)**

B.E/B.Tech Honours

B.E/B.Tech Minor

courses

COURSE OUTCOMES:

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

- Understand Node JS and REPL terminal.
- Experiment with Node JS Modules and Node Package Manager.
- Develop applications to handle events in Node JS
- Make use of Web Server to manage database.
- Demonstrate Express Framework

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	1	1	1	1	1	2	1	3	3	3
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5	3	3	3	3	3	1	1	1	1	1	2	1	3	3	3

UNIT-I Node.js Fundamentals

6

Features and advantages of Node JS - Traditional Web Server Model - Node.js Process Model - Asynchronous programming with Node.js - Node.js Installation - working in REPL - Node JS Console - Creating a Node File with JavaScript - Accessing a Node.js File Through the Command Line Interface - Using Node.js in VS Code.

UNIT II Node.js Modules and Package Management

6

Primitive Types - Object Literal – Functions – Buffer - Access Global Scope. Node JS Module - Module Types - Core Modules - Local Modules - Third Party Modules - Module Exports. Using Modules in a Node.js File- Using the Built in HTTP- URL- Query String Module- Creating a Custom Module – NPM - Installing Packages Locally - Adding dependency in package.json - Installing packages globally - Updating packages.

UNIT-III Web Server

6

Handling HTTP requests - Sending requests - Reading- Writing a File- Writing a file asynchronously - Opening a file - deleting a file - Other IO Operations: Append- Rename - Truncate. File System Module with URL Module Create- Read- Remove a Directory - Core Node.js debugger - Node Inspector - Built-in debugger in IDEs.


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UNIT-IV Events and Database Connectivity

6

EventEmitter class - Methods and Events of EventEmitter Class - Returning event emitter - Extend EventEmitter Class- Passing Arguments and 'this' to listeners - Asynchronous and Synchronous call - Handle Events only Once - Error Events. DATABASE CONNECTIVITY: Connection string – Configuring - Working with insert- select command - Updating records - Deleting records - Drop tables - Ordered Result Set

UNIT V Express Framework Essentials

6

Introduction to Express Framework- Express Server Request-Response Routes- Route Parameters- Multiple Route Callback/Handler Functions- Methods of Response Object- Chaining Route Handlers- Send Static Files- Accept User Input- File Upload with Express- Manage Cookies- Send file as a response- Templates and Express.

List of Experiments:

1. Hello World with Express
2. Static File Server
3. Basic REST API
4. Middleware Implementation
5. Authentication with Passport
6. Database Integration with MongoDB
7. Error Handling and Logging
8. Testing with Jest

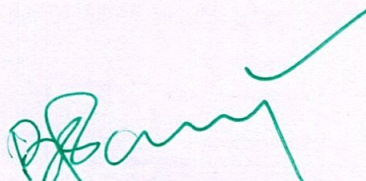
Theory :30 hrs Practical :30 hrs Total : 60 Hrs

TEXT BOOK:

1. Dhruvi Shah- "Node.JS Guidebook"- BPB Publications- 2018.

REFERENCE BOOK:

1. Basarat Ali Syed- Beginning Node.js- A press- 2014.
2. Anthony Accomazzo, Ari Lerner, Nate Murray, Clay Allsopp, "Fullstack React: The Complete Guide to ReactJS and Friends"


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COURSE OUTCOMES:

By the end of this course, students should be able to:

- Explain the detailed architecture, Database properties and storage requirements
- Differentiate and identify right database models for real time applications
- Outline Key value architecture and characteristics
- Design Schema and implement CRUD operations, distributed data operations
- Develop Application using NOSQL databases

CO's	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PSO's														
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	1	1	1	1	1	2	1	3	3	3
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5	3	3	3	3	3	1	1	1	1	1	2	1	3	3	3

Unit 1 Introduction to NOSQL Concepts

6

Data base revolutions: First generation, second generation, third generation, Managing Transactions and Data Integrity, ACID and BASE for reliable database transactions, Speeding performance by strategic use of RAM, SSD, and disk, Achieving horizontal scalability with Data base sharding, Brewers CAP theorem.

Unit II NOSQL Data Architecture Patterns

6

NoSQL Data model: Aggregate Models- Document Data Model- Key-Value Data Model Columnar Data Model, Graph Based Data Model Graph Data Model, NoSQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication to scale reads, Database distributed queries to Data nodes.

Unit III Key Value Data Stores

6

From array to key value databases, Essential features of key value Databases, Properties of keys, Characteristics of Values, Key-Value Database Data Modeling Terms, Key-Value Architecture and implementation Terms, Designing Structured Values, Limitations of Key-Value Databases, Design Patterns for Key-Value Databases.


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Unit IV Document Oriented Database

6

Document, Collection, Naming, CRUD operation, querying, indexing, Replication, Sharding, Consistency Implementation: Distributed consistency, Eventual Consistency, Capped Collection.

Unit V Case studies

6

MongoDB – Installation – Configuration – Key Value Stores – working on Document oriented database using Mongo DB.

List of Experiments:

1. Installation and Basic Commands
2. CRUD Operations
3. Data Modeling with MongoDB
4. Indexing and Query Optimization
5. Aggregation Framework
6. Mongoose for Node.js
7. Data Import/Export
8. Authentication and Authorization

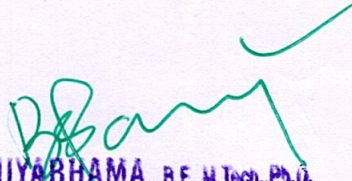
Theory :30 hrs Practical :30 hrs Total : 60 Hrs

Text Book:

1. Christopher D.manning, Prabhakar Raghavan, Hinrich Schutze, An introduction to Information Retrieval, Cambridge University Press

Reference Book:

1. Daniel Abadi, Peter Boncz and Stavros Harizopoulos, The Design and Implementation of Modern Column-Oriented Database Systems, Now Publishers.
2. Guy Harrison, Next Generation Database: NoSQL and big data, Apress


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COURSE OUTCOMES

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

- Design an information retrieval system for the given application
- Apply the various modeling and evaluation techniques to design applications
- Solve the problems related to classification or clustering
- Design an open source search engine framework and explore its capabilities
- Design and implement a recommender system

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO4	3	3	3	3	3	2	1	1	2	1	2	2	2	3	3
CO5	3	3	3	2	3	2	2	1	1	2	1	2	1	1	1

UNIT I**INTRODUCTION**

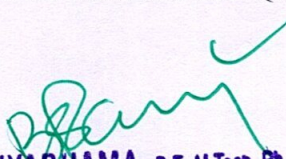
9

Information Retrieval – Early Developments – The IR Problem – The User's Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT II**MODELING AND RETRIEVAL EVALUATION**

9

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.


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UNIT III TEXT CLASSIFICATION AND CLUSTERING 9

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

UNIT IV WEB RETRIEVAL AND WEB CRAWLING 9

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT V RECOMMENDER SYSTEM 9

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

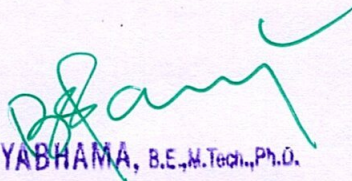
TOTAL: 45hours

TEXT BOOKS

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Second Edition, ACM Press Books, 2011.

REFERENCES

1. Ricci, F, Rokach, L. Shapira, B.Kantor, "Recommender Systems Handbook", First Edition, 2011.
2. C. Manning, P. Raghavan, and H. Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008.
3. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2010.
4. David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms, and Heuristics", Academic Press, Second Edition, 2004.


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COURSE OUTCOMES

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

- Explain existing and emerging deep learning architectures for text and speech processing.
- Apply deep learning techniques for NLP tasks, language modelling and machine translation.
- Explain coreference and coherence for text processing.
- Build question-answering systems, chatbots and dialogue systems.
- Apply deep learning models for building speech recognition and text-to-speech systems.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO4	3	3	3	3	3	2	-	1	2	1	2	2	2	3	2
CO5	3	3	3	2	3	1	-	1	1	2	1	2	1	1	1

UNIT I NATURAL LANGUAGE BASICS

9

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stopwords – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model.

UNIT II TEXT CLASSIFICATION

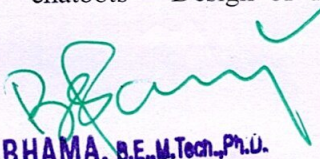
9

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model – FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models.

UNIT III QUESTION ANSWERING AND DIALOGUE SYSTEMS

9

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems – evaluating dialogue systems.


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UNIT IV TEXT-TO-SPEECH SYNTHESIS

9

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, Wave Net and other deep learning-based TTS systems.

UNIT V AUTOMATIC SPEECH RECOGNITION & RECENT TRENDS 9

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems-Transformer based models(BERT)-Transfer Learning and Pretraining-Cross Lingual and Multilingual analysis-Emotion and Sentiment analysis-NMT-Privacy and Ethics.

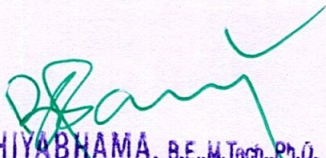
Total :45 hrs

TEXT BOOK :

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Third Edition, 2022.

REFERENCES:

1. Dipanjan Sarkar, “Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data”, APress,2018.
2. Tanveer Siddiqui, Tiwary U S, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.
3. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, “Fundamentals of Speech Recognition” 1st Edition, Pearson, 2009.
4. Steven Bird, Ewan Klein, and Edward Loper, “Natural language processing with Python”, O’REILLY.


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COURSE OUTCOMES

At the end of the course, student will able to

- Comprehend the cloud concepts and fundamentals.
- Analyze the security challenges in the cloud.
- Define cloud policies for Access Control and Identity Management.
- Compare different cloud security patterns.
- Perform auditing in the cloud environment to identify risks and apply the various risk management tools to mitigate those risks.

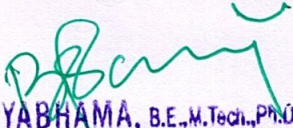
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CO5	3	3	3	2	3	1	-	1	1	2	1	2	1	1	1

UNIT I FUNDAMENTALS OF CLOUD SECURITY**9**

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication - Nonrepudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT II SECURITY DESIGN AND ARCHITECTURE**9**

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key.


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UNIT III ACCESS CONTROL AND IDENTITY MANAGEMENT

9

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention.

UNIT IV CLOUD SECURITY DESIGN PATTERNS

9

Introduction to Design Patterns - Cloud bursting - Geo-tagging - Secure Cloud Interfaces - Cloud Resource Access Control - Secure On-Premise Internet Access - Secure External Cloud.

UNIT V MONITORING, AUDITING AND MANAGEMENT

9

Proactive activity monitoring - Incident Response - Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation - Reporting and Management - Tamper-proofing audit logs - Quality of Services - Secure Management - User management - Identity management - Security Information and Event Management.

TOTAL: 45hours

TEXT BOOK:

1. Raj Kumar Buyya , James Broberg, Andrzej Goscinski, “Cloud Computing:”, Wiley 2013.
2. Mather, Kumaraswamy and Latif, “Cloud Security and Privacy”, OREILLY 2011.

REFERENCE BOOKS:

1. Dave shackleford, “Virtualization Security”, SYBEX a wiley Brand 2013.
2. Mark C. Chu-Carroll , “Code in the Cloud”,CRC Press, 2011.
3. Rajkumar Buyya, Christian Vechhiola, S. ThamaraiSelvi ,Mastering Cloud Computing Foundations and Applications Programming , Morgan Kaufmann is an imprint of Elsevier, 2013.


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COURSE OUTCOMES:

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

- Describe the Mobile device technology and challenges in mobile forensics.
- Perform the digital evidences seizure from different digital devices.
- Perform mobile forensic by selecting suitable environment.
- Analyse the feature phones based on appropriate parameters.
- Analyse the smart digital devices using Oxygen Forensic Suite.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
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CO4	3	3	3	3	3	2	-	1	2	1	2	2	2	3	2
CO5	3	3	3	2	3	1	-	1	1	2	1	2	1	1	1

UNIT I: INTRODUCTION

9

A Brief History of the Mobile Devices - Mobile Device Data: The Relevance Today - Mobile Device Technology and Mobile Forensics - Examination Awareness and Progression - Data Storage Points - Computer Forensics Defined - Applying Forensic Processes and Procedures - Approach to Mobile Device Forensics - Standard Operating Procedure Document - Specialty Mobile Forensic Units - Forensic Software - Common Misconceptions.

UNIT II: SEIZING DIGITAL EVIDENCES FROM DIGITAL DEVICES

9

IoT devices - Common Consumer Types - Infotainment Systems - Wearables - Unmanned Aircraft Systems - Understanding Mobile Device Communication - Understanding Mobile Device Security - Photographing the Evidence at the Scene - Tagging and Marking Evidence - Documenting the Evidence at the Scene - Dealing with Power Issues: The Device State - Bagging Sensitive Evidence - Transporting Mobile Device Evidence - Establishing Chain of Custody.


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UNIT III: MOBILE FORENSIC TOOLS AND PREPARING THE ENVIRONMENT 9

Mobile Forensic Tool Overview - Collection Types - Collection Pyramid - Tools Available - Creating the Ideal System - Device Drivers and Multiple-Tool Environments - Conducting a Collection of a Mobile Device - Initial Considerations - Initial Documentation - Mobile Device Isolation Methods - Analyzing SIM Cards.

UNIT IV: ANALYSING FEATURE PHONES 9

Mobile Device Processing Workflow - Feature Phone Collections - Apple iOS Connections and Collections - Advanced iOS Analysis - Android OS Connections and Collections - Advanced Android Analysis - Querying SQLite and Taming the Forensic Snake.

UNIT V: ADVANCED DEVICE ANALYSIS 9

IoT, Wearables and Drones - Smart Home Devices - Wearable Devices - Unmanned Aircraft Systems - Presenting the Data as a Mobile Forensics Expert. **Case study:** Oxygen Forensic Suite.

LAB EXPERIMENTS:

1. Data extraction from call logs using Sleuth Kit.
2. Data extraction from SMS and contacts using Sleuth Kit
3. Install Mobile Verification Toolkit or MVT and decrypt encrypted iOS backups.
4. Process and parse records from the iOS system.
5. Extract installed applications from Android devices.
6. Extract diagnostic information from Android devices through the adb protocol.

Theory :30 hrs Practical :30 hrs Total : 60 Hrs

TEXT BOOK:

1. Lee Reiber, "Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis and Presentation", 2nd edition, McGraw Hill Foundation, 2019.

REFERENCE BOOKS:

1. John Bair, "Seeking the Truth from Mobile Evidence: Basic Fundamentals, Intermediate and Advanced Overview of Current Mobile Forensic Investigations", 1st edition, Academic Press, 2017
2. Oleg Afonin and Vladimir Katalov, "Mobile Forensics – Advanced Investigative Strategies: Master powerful strategies to acquire and analyze evidence from real-life scenarios", 1st edition, Packt Publishing, 2016
3. Soufiane Tahiri, "Mastering Mobile Forensics", 1st edition, Packt Publishing, 2016
4. Igor Mikhaylov, "Mobile Forensics Cookbook", 1st edition, Packt Publishing, 2017
5. Mohammed Moreb, "Practical Forensic Analysis of Artifacts on iOS and Android Devices: Investigating Complex


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COURSE OUTCOMES:

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

- Understand the principles and fundamentals of DevOps.
- Gain practical knowledge of DevOps tools and technologies commonly used in industry.
- Design and Implement CI/CD pipelines to automate software build, testing, and deployment processes.
- Continuously improve processes and practices in alignment with DevOps principles.

• CO / PO, PSO Mapping • (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
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5	3	3	3	3	3	1	1	1	1	1	2	1	3	3	3

UNIT I INTRODUCTION

6

Definition, Values, Principles, Methodologies, Practices, Tools, Communication, Wall of confusion, Communication, Collaboration, Transition, Continuous improvement (Kaizen)

UNIT II BUILDING BLOCKS

6

Lean & Agile - Methodologies, Implementations, Build, Measure, Learn ITIL, ITSM, SDLC.

UNIT III INFRASTRUCTURE AUTOMATION

6

Infrastructure as Code (IaC) concepts and benefits - Tools like Ansible, Chef, or Puppet for configuration management - Version control for infrastructure code - Provisioning and managing infrastructure using IaC tools.

UNIT IV CONTINUOUS DELIVERY

6

CI practices, CD pipeline, QA, CI tools, Securing CI/CD pipeline - DevSecOps, Development tools, inherit tools, Build tools, Deploy tools, Operation tools.

UNIT V RELIABILITY ENGINEERING

6

SRE basics, Practice - Release Engineering, Change Management, Self-service automation, SLAs, Incident Management, Postmortems, Troubleshooting, Performance Engineering, Scalability, Organization, Emerging areas: Cloud, Containers, Server-less, Security.

(Signature)
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List of Experiments

1. Version Control with Git
2. Continuous Integration (CI) with Jenkins
3. Infrastructure as Code (IaC) with Terraform
4. Configuration Management with Ansible
5. Containerization with Docker
6. Orchestration with Docker Compose
7. Continuous Deployment (CD) with Jenkins
8. Monitoring and Logging with ELK Stack


Theory :30 hrs Practical :30 hrs Total : 60 Hrs

TEXT BOOK

1. Gene Kim, Kevin Behr, George Spafford, "The Phoenix Project - a Novel IT, DevOps, and helping your Business Win", 2018.

REFERENCES

1. Gary Gruver, Tommy Mouser, Leading the Transformation - Applying Agile and DevOps principles at scale, IT Revolution, Portland.
2. Gene Kim, Jez Humble, Patrick Debois, John Willis, The DevOps Handbook - How to create world class agility, reliability, and security in technology organizations".
3. Kenin, Gene, George, The Visible OPS Handbook - Implementing ITIL in 4 practical and auditable steps".
4. Jez Humble, David Farley, Continuous Delivery, Addison -Wesley Signature series.
5. Jeninfer Davis & Katherine Daniels, Effective DevOps - Building a culture of collaboration, affinity, and tooling at scale.
6. Mary Poppendieck & Tom Poppendieck, Lean Software Development - An Agile Toolkit.
7. John Allspaw, Web Operations - Keeping the Data on Time.
8. Thomas, The Practice of cloud system administration - Designing and operating large distributed systems.


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COURSE OUTCOMES

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

- Describe the ethical and legal aspects of ethical hacking .
- Perform penetration testing using metasploit framework.
- Exploit the vulnerabilities present in the different operating systems and web applications.
- Perform the vulnerability analysis using different tools.
- Penetrate the victim's network / system using privilege escalation.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	1.	3	1	2	3	3	3	3	2	3	2	2	2
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
CO3	3	3	3	3	3	2	2	3	3	3	2	3	3	3	2
CO4	3	3	2	3	2	1	2	3	3	3	3	3	3	2	2
CO5	3	3	1	3	1	2	3	3	3	3	2	3	2	2	2

UNIT I INTROCUCTION TO ETHICAL DISCLOSURE

9

Ethics of ethical hacking – Ethical hacking and the legal system – proper and ethical disclosure.

UNIT II PENETRATION TESTING AND TOOLS

9

Social engineering attacks – Physical penetration attacks – Insider attacks – Using the Backtrack Linux distribution – Using the Metasploit framework – Managing a penetration test.

UNIT III EXPLOITATION

9

Programming survival skills – Basic Linux exploits – Windows exploits – Understanding and detecting Content-Type attacks – Web application security vulnerabilities.


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UNIT IV VULNERABILITY ANALYSIS

9

Passive analysis – Advanced static analysis with IDA pro – Client side browser exploits – Exploiting the windows access control model – From vulnerability to exploit – Closing the holes: Mitigation.

UNIT V PENETRATION

9

Acquiring situation awareness – Privilege escalation – Maintaining access – Installing backdoors – Identifying and exploiting further targets.

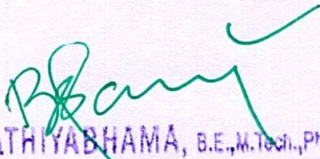
TOTAL: 45hours

TEXT BOOK:

1. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey and Terron Williams, “Gray Hat Hacking The Ethical Hackers Handbook”, 3rd Edition, McGraw Hill Education, 2017.

REFERENCES:

1. Rafay Baloch, “Ethical Hacking and Penetration Testing Guide”, Auerbach Publications, 2014.
2. Stephen Fletcher, “Hacking with Kali Linux: A Beginner's Guide to Ethical Hacking with Kali and Cybersecurity, Includes Linux Command Line, Penetration Testing, Security Systems and Tools for Computer”, Monticello Solutions Ltd, 2020.
3. Jon Erickson, “Hacking: The Art of Exploitation”, Second Edition, No Starch Press, 2008.


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COURSE OUTCOMES:

At the end of this course the students will be able to

- Describe the basic principles of digital forensics.
- Apply the suitable data acquisition technique to collect the forensic data.
- Apply the different techniques to collect digital evidences from the acquired data.
- Validate the digital evidences and write report on the collected digital evidences.
- Apply the Sleuth Kit Autopsy tool to perform forensics on images and disks

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	3	2	1	3	1	2	2	2	2	3	2	3	2	2	2
CO2	2	3	3	3	3	3	2	1	2	3	2	3	3	3	2
CO3	3	3	2	3	3	2	1	1	2	3	2	3	3	3	2
CO4	2	3	2	3	2	1	1	2	1	3	2	3	3	2	1
CO5	2	3	1	3	1	2	1	1	1	3	2	3	2	2	1

UNIT I INTRODUCTION

9

An Overview of Digital Forensics - Preparing for Digital Investigations - Maintaining Professional Conduct - Preparing a Digital Forensics Investigation - Procedures for Private-Sector High-Tech Investigations - Understanding Data Recovery Workstations and Software - Conducting an Investigation.

UNIT II DATA ACQUISITION

9

Understanding Storage Formats for Digital Evidence - Determining the Best Acquisition Method - Contingency Planning for Image Acquisitions - Using Acquisition Tools - Validating Data Acquisitions - Performing RAID Data Acquisitions - Using Remote Network Acquisition Tools - Using Other Forensics Acquisition Tools.

UNIT III PROCESSING CRIME AND INCIDENT SCENES

9

Identifying Digital Evidence - Collecting Evidence in Private-Sector Incident Scenes - Processing Law Enforcement Crime Scenes - Preparing for a Search - Securing a Digital Incident or Crime


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Scene - Seizing Digital Evidence at the Scene - Storing Digital Evidence - Obtaining a Digital Hash.

UNIT IV DATA VALIDATION AND REPORT WRITING

9

Determining What Data to Collect and Analyze - Validating Forensic Data - Understanding the Importance of Reports - Guidelines for Writing Reports - Generating Report Findings with Forensics Software Tools.

UNIT V DIGITAL FORENSIC TOOLS

9

Evaluating Digital Forensics Tool Needs - Digital Forensics Software Tools - Digital Forensics Hardware Tools – Validating and Testing Forensics Software – **Case Study:** Sleuth Kit Autopsy tool.

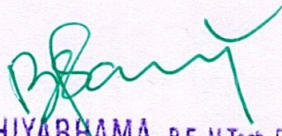
TOTAL: 45hours

TEXT BOOK:

1. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., “Guide to Computer Forensics and Investigations, 6th ed., Cengage Learning, 2019.

REFERENCE BOOKS:

1. Eoghan Casey, “Handbook of Digital Forensics and Investigation”, 1st edition, Academic Press, 2009.
2. Marjie T. Britz, “Computer Forensics and Cyber Crime”, 3rd edition, Pearson Education, 2013.
3. Richard Boddington , “Practical Digital Forensics”, 1st edition, Packt Publisher, 2016
4. Aaron Philipp, David Cowen and Chris Davis, “Hacking Exposed Computer Forensics: Computer Forensics Secrets & Solutions”, Second Edition, McGraw Hill, 2009
5. Deje and Murugan, “Cyber Forensics”, 1st edition, Oxford Press, 2018.


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