SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE
(An Autonomous Institution)
(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution &
Accredited by NAAC with "A" Grade)
Madagadipet, Puducherry - 605 107

Department of Computer Science and Engineering

Minutes of Board of Studies

The first Board of Studies meeting of Department of Computer Science and Engineering was held on 17th July 2020 at 10:00 A.M in the Center V Lab, Department of CSE.
Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	Dr. N. Danapaquiame Professor, Department of CSE, SMVEC	Chairman	
External Members			
2	Dr. S. R. Balasundaram, Professor and Head Department of Computer Applications, National Institute of Technology, Trichy.	Pondicherry University Nominee	S. R. Balasundaram
3	Dr. Chokkalingam Subramanian, Professor & Head, Department of Information Technology, Saveetha University, Chennai.	Academic Council Nominee	SP. Chn (SP. Chokkalingam)
4	Dr.S.Udhayakumar, Professor, Department of Computer Science and Engineering, Rajalakshmi College of Engineering, Chennai.	Academic Council Nominee	
5	S.Diwahar, M.Tech., Senior Engineer, Dell Technologies, Bangalore	Member	S. Diwahar
6	R.Sakthi Murugan, Director, Interjet India Pvt. Ltd., Puducherry,	Member	
Internal Members			
7	Prof.K.Premkumar, Professor, Department of CSE, SMVEC	Member	
8	Dr.E.Kodhai, Professor, Department of CSE, SMVEC	Member	
9	Dr.P.Iyappan, Associate Professor Department of CSE, SMVEC	Member	
10	Dr.V.Vijayakumar, Associate Professor, Department of CSE, SMVEC	Member	

Co-opted Members			
11	Dr.M.A.Ishrath Jahan Associate Professor, Department of English, SMVEC	Member	M.A. Ishrath
12	Dr.T.Jayavarthanan Professor, Department of Physics, SMVEC	Member	
13	Prof.M.Rajeswari, Assistant Professor, Department of Chemistry, SMVEC	Member	
14	Prof.K.Raja, Assistant Professor, Department of Mathematics, SMVEC	Member	

Agenda of the Meeting

1) Discuss about the curriculum Structure of B.Tech – Computer Science and Engineering, M.Tech – Computer Science and Engineering.
2) To discuss and approve the B.Tech. Degree Regulations 2020 (R-2020), Curriculum from I to VIII semesters and syllabus for I to IV semesters for the B.Tech – Computer Science and Engineering and the students admitted in the Academic Year 2020-21. (First Year)
3) To discuss and approve the B.Tech. Degree Regulation 2019, Curriculum from I to VIII semesters and syllabus for I to IV semesters for the B.Tech – Computer Science and Engineering and the students admitted in the Academic Year 2019-20 (Second Year).
4) To discuss and approve the B.Tech. Degree Curriculum and Syllabus from I to VIII semesters under Pondicherry University Regulations 2013 for the B.Tech – Computer Science and Engineering and the students admitted in the Academic Year 2017-18 (Final Year) and in the Academic Year 2018-19 (Third Year).
5) To discuss and approve the M.Tech. Degree Regulations 2020 (R-2020), Curriculum from I to IV semesters and Syllabus for I to II semesters for the M.Tech – Computer Science and Engineering and the students admitted in the Academic Year 2020-21. (First Year)
6) To discuss and approve the M.Tech. Degree Curriculum and Syllabus from I and IV semesters under Pondicherry University Regulations 2011 for the M.Tech – Computer Science and Engineering and the students admitted in the Academic Year 2019-20 (Second Year).
7) To discuss about the uniqueness of the Curriculum (R-2020)
8) To discuss and approve Evaluation Systems
9) To discuss about the Innovative Teaching / Practices Methodology adopted to handle the emerging. / Advanced Technological concept courses
10) To discuss and approve the Ph.D Programme in Computer Science and Engineering for the students admitted in the academic year 2020-21.
11) Any other item with the permission of chair

Minutes of the Meeting

Dr. N. Danapaquiame, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies and the meeting thereafter deliberated on agenda items that had been approved by the Chairman.

Item:1	The curriculum Structure of B.Tech - Computer Science and Engineering and M.Tech – Computer Science and Engineering has been discussed.
Item:2	The B.Tech Degree 2020 Regulation, curriculum and syllabus has been approved

	and recommended to Academic council with following corrections. 1. In First Semester, "Programming in Python", subject needs to be transferred to III semester. 2. In Sixth Semester, "Artificial Intelligence and Expert Systems Laboratory", needs to add few more exercises for Machine Learning with respect to Supervised and Unsupervised Learning. 3. In Seventh Semester, "IoT and Edge computing", needs to include comparison of Cloud Computing and Edge Computing. 4. In all the subjects, needs to provide standard web resources like IIT – Virtual Labs.
Item:3	The B.Tech Degree 2019 Regulation, curriculum and syllabus has been approved and recommended to Academic council with following corrections. 1. In Fifth Semester, "Web Application Development" needs to swap IV and V Unit by including AJAX, CSS, JQuery and Javascript in IV unit.
Item:4	The B.Tech Degree 2013 Regulation, curriculum and syllabus has been approved and recommended to Academic council.
Item:5	The M.Tech Degree 2020 Regulation, curriculum and syllabus has been approved and recommended to Academic council with following corrections. • In First Semester, "Artificial Intelligence and Agent Technology" needs to update the first two topics in Unit IV. • In First Semester elective, "Advanced Java Programming", needs to include Hibernate and Spring Framework in Unit III. • In First Semester elective, "Quantum Computing" needs to include more topics.
Item:6	The M.Tech Degree 2011 Regulation, curriculum and syllabus has been approved and recommended to Academic council.
Item:7	The uniqueness of the Curriculum (R-2020) has been discussed.
Item:8	Discussed on the Evaluation System in regulations 2020,19 for B.Tech and M.Tech Computer Science and Engineering and recommended to Academic Council.
Item:9	Discussed about the the Innovative Teaching / Practices Methodology adopted to handle the emerging. / Advanced Technological concept courses.
Item:10	Ph.D Regulations has been approved and recommended to Academic Council.

The meeting was concluded at 2:30PM with vote of thanks by **Prof. K. Premkumar**, Professor, Dept of Computer Science and Engineering.

Dr. N. Danapaquiame
CHAIRMAN-BOS

Dr.V.S.K . Venkatachalapathy
Director Cum Principal
Chairman- Academic Council

ANNEXURE - I

(Semester I to IV - Curriculum and Syllabi of R-2019)

SEMESTER – I										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	T101	Mathematics – I	BS	3	1	0	4	25	75	100
2	T102	Physics	BS	4	0	0	4	25	75	100
3	T103	Chemistry	BS	4	0	0	4	25	75	100
4	T104	Basic Electrical and Electronics Engineering	ES	3	1	0	4	25	75	100
5	T105	Engineering Thermodynamics	ES	3	1	0	4	25	75	100
6	T106	Computer Programming	ES	3	1	0	4	25	75	100
Practical										
7	P101	Computer Programming Laboratory	ES	0	0	3	2	50	50	100
8	P102	Engineering Graphics	ES	2	0	3	2	50	50	100
9	P103	Basic Electrical and Electronics Laboratory	ES	0	0	3	2	50	50	100
							30	300	600	900

SEMESTER – II										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	T107	Mathematics – II	BS	3	1	0	4	25	75	100
2	T108	Material Science	BS	4	0	0	4	25	75	100
3	T109	Environmental Science	BS	4	0	0	4	25	75	100
4	T110	Basic Civil and Mechanical Engineering	ES	4	0	0	4	25	75	100
5	T111	Engineering Mechanics	ES	3	1	0	4	25	75	100
6	T112	Communicative English	HS	4	0	0	4	25	75	100
Practical										
7	P104	Physics Laboratory	BS	0	0	3	2	50	50	100
8	P105	Chemistry Laboratory	BS	0	0	3	2	50	50	100
9	P106	Workshop Practice	ES	0	0	3	2	50	50	100
Mandatory Course										
10	P107	NSS/NCC*	MC	0	0	0	-	-	-	-
							30	300	600	900

**** To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation***

SEMESTER – III

Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CST31	Numerical Methods	BS	2	2	0	3	25	75	100
2	U19CST32	Data Structures	ES	3	0	0	3	25	75	100
3	U19CST33	Digital Design and Microprocessors	ES	3	0	0	3	25	75	100
4	U19CST34	Automata and Compiler Design	PC	2	2	0	3	25	75	100
5	U19CST35	Operating Systems	PC	3	0	0	3	25	75	100
6	U19CST36	Data Communications and Computer Networks	PC	3	0	0	3	25	75	100
Practical										
7	U19CSP31	Numerical Methods Laboratory	BS	0	0	2	1	50	50	100
8	U19CSP32	Data Structures Laboratory	ES	0	0	2	1	50	50	100
9	U19CSP33	Digital Design and Microprocessors Laboratory	ES	0	0	2	1	50	50	100
10	U19CSP34	Linux Internals Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U19CSC3X	Certification Course - I	EEC	0	0	4	-	100	-	100
12	U19CSS31	Skill Development Course 1: General Proficiency - I	EEC	0	0	2	-	100	-	100
13	U19CSS32	Skill Development Course 2 *	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U19CSM31	Physical Education	MC	0	0	2	-	100	-	100
							22	750	650	1400

SEMESTER – IV

Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CST41	Discrete Mathematics and Graph Theory	BS	2	2	0	3	25	75	100
2	U19CST42	Programming in Java	ES	3	0	0	3	25	75	100
3	U19CST43	Database Management Systems	PC	3	0	0	3	25	75	100
4	U19CST44	Design and Analysis of Algorithms	PC	2	2	0	3	25	75	100
5	U19CSE4X	Professional Elective - I	PE	3	0	0	3	25	75	100
6	U19XXO4X	Open Elective - I	OE	3	0	0	3	25	75	100
Practical										
7	U19CSP41	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
8	U19CSP42	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
9	U19CSP43	Design and Analysis of Algorithms Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CSC4X	Certification Course - II	EEC	0	0	4	-	100	-	100
11	U19CSS41	Skill Development Course 3: General Proficiency - II	EEC	0	0	2	-	100	-	100
12	U19CSS42	Skill Development Course 4 *	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U19CSM41	Indian Constitution	MC	2	0	0	-	100	-	100
							21	700	600	1300

**** Skill Development Courses (2 and 4) are to be selected from the list given in Annexure IV***

SEMESTER – V

Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CST51	Probability and Statistics	BS	2	2	0	3	25	75	100
2	U19CST52	Handheld Computing: Design and Application Development	PC	3	0	0	3	25	75	100
3	U19CST53	Web Application Development	PC	3	0	0	3	25	75	100
4	U19CST54	Software Engineering and Testing	PC	3	0	0	3	25	75	100
5	U19CSE5X	Professional Elective - II	PE	3	0	0	3	25	75	100
6	U19XXO5X	Open Elective – II	OE	3	0	0	3	25	75	100
Practical										
7	U19CSP51	Handheld Computing Laboratory	PC	0	0	2	1	50	50	100
8	U19CSP52	Web Application Development Laboratory	PC	0	0	2	1	50	50	100
9	U19CSP53	Software Testing Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CSC5X	Certification Course - III	EEC	0	0	4	-	100	-	100
11	U19CSS51	Skill Development Course 5: Foreign Language / IELTS - I	EEC	0	0	2	-	100	-	100
12	U19CSS52	Skill Development Course 6: Presentation Skills using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U19CSM51	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	700	600	1300

SEMESTER – VI

Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CST61	Artificial Intelligence and Expert Systems	PC	2	2	0	3	25	75	100
2	U19CST62	C# and .Net Programming	PC	3	0	0	3	25	75	100
3	U19CST63	Cloud Computing and Big Data	PC	3	0	0	3	25	75	100
4	U19CST64	Animation and Visual Effects	PC	3	0	0	3	25	75	100
5	U19CSE6X	Professional Elective - III	PE	3	0	0	3	25	75	100
6	U19XXO6X	Open Elective - III	HS	3	0	0	3	25	75	100
Practical										
7	U19CSP61	Artificial Intelligence and Expert Systems Laboratory	PC	0	0	2	1	50	50	100
8	U19CSP62	C# and .Net Programming Laboratory	PC	0	0	2	1	50	50	100
9	U19CSP63	Animation and Visual Effects Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CSC6X	Certification Course - IV	EEC	0	0	4	-	100	-	100
11	U19CSS61	Skill Development Course 7: Foreign Language / IELTS - II	EEC	0	0	2	-	100	-	100
12	U19CSS62	Skill Development Course 8: Technical Seminar	EEC	2	0	0	-	100	-	100
13	U19CSS63	Skill Development Course 9: NPTEL / MOOC - I	EEC	0	0	0	-	100	-	100
Mandatory Course										
14	U19CSM61	Professional Ethics	MC	2	0	0	-	100	-	100
							21	800	600	1400

SEMESTER – VII										
Sl. No	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	U19CST71	IoT and Edge Computing	PC	3	0	0	3	25	75	100
2	U19CST72	Data Science and Digital Marketing Analytics	PC	3	0	0	3	25	75	100
3	U19CSE7X	Professional Elective – IV	PE	3	0	0	3	25	75	100
4	U19XXO7X	Open Elective – IV	OE	3	0	0	3	25	75	100
Practical										
5	U19CSP71	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
6	U19CSP72	IoT and Edge Computing Laboratory	PC	0	0	2	1	50	50	100
7	U19CSP73	Data Science and Digital Marketing Analytics Laboratory	PC	0	0	2	1	50	50	100
8	U19CSP74	Comprehensive Viva-Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U19CSW71	Project phase – I	PW	0	0	4	2	50	50	100
10	U19CSW72	Internship / Inplant Training	PW	0	0	0	2	100	-	100
							20	500	500	1000

SEMESTER – VIII										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	U19CST81	Block chain and Cryptography	PC	3	0	0	3	25	75	100
2	U19CSE8X	Professional Elective – V	PE	3	0	0	3	25	75	100
3	U19CSE8X	Professional Elective – VI	PE	3	0	0	3	25	75	100
Practical										
4	U19CSP81	Entrepreneurship Management	HS	0	0	2	1	100	-	100
Project Work										
5	U19CSW81	Project phase – II	PW	0	0	16	8	40	60	100
Employability Enhancement Course										
6	U19CSS81	Skill Development Course 10: NPTEL / MOOC -II	EEC	0	0	0	-	100	-	100
							18	315	285	600

ANNEXURE – I
PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1.	U19CSE41	Database Administration
2.	U19CSE42	E-Business
3.	U19CSE43	Object Oriented Analysis And Design
4.	U19CSE44	Scripting Languages
5.	U19CSE45	Fundamentals of Programming Languages
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1.	U19CSE51	Enterprise Solutions
2.	U19CSE52	Game Development using Unity
3.	U19CSE53	Functional Programming
4.	U19CSE54	Robotics Process Automation
5.	U19CSE55	Software Project Management
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1.	U19CSE61	Augmented Reality
2.	U19CSE62	Service Oriented Architecture
3.	U19CSE63	Agile Development
4.	U19CSE64	Embedded Systems
5.	U19CSE65	Assistive Technology
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1.	U19CSE71	Network Security
2.	U19CSE72	Data Mining and Warehousing
3.	U19CSE73	Virtual Reality
4.	U19CSE74	Robotics
5.	U19CSE75	Haptic Computing
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U19CSE80	Ethical Hacking
2.	U19CSE81	Deep Learning
3.	U19CSE82	Mobile Computing
4.	U19CSE83	Pervasive Computing
5.	U19CSE84	Cyber Security and Digital Forensics

Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U19CSE85	Quantum Computing
2.	U19CSE86	Trust Computing
3.	U19CSE87	Client Server Computing
4.	U19CSE88	Human Computer Interaction
5.	U19CSE89	Natural Language Processing

ANNEXURE – II

OPEN ELECTIVE COURSES (R-2019)

Sl. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I (Offered in Semester IV)				
1	U19EEO41	Solar Photovoltaic Fundamentals and Applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics
2	U19EEO42	Electrical Safety	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, BME, IT, CSE
3	U19ECO41	Engineering Computation with MATLAB	ECE	ICE, EEE, MECH, CIVIL, BME, Mechatronics
4	U19ECO42	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, BME, Mechatronics
5	U19CSO41	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U19CSO42	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U19CSO43	Programming in Java	CSE	ECE, MECH, Mechatronics
8	U19ITO41	Database System: Design & Development	IT	EEE, ECE, ICE, BME
9	U19ITO42	R programming	IT	EEE, ECE, ICE, BME, MECH, Mechatronics
10	U19ICO41	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL
11	U19ICO42	Control System Engineering	ICE	CSE, IT, MECH
12	U19MEO41	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME
13	U19MEO42	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
14	U19MEO43	Power Plants for Electrical Engineering	MECH	EEE
15	U19CEO41	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics

16	U19CEO42	Building Science and Engineering	CIVIL	EEE, MECH, BME
17	U19BMO41	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, MECH, Mechatronics
18	U19BMO42	Telemedicine	BME	EEE, ECE, CSE, IT, ICE
19	U19CCO41	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U19CCO42	Introduction to Communication Systems	CCE	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics
Open Elective – II / Open Elective – III				
1	U19HSO51 / U19HSO61	Product Development and Design	MBA	**Common to B. Tech** (Offered in Semester V for **EEE, ECE, ICE, CIVIL, BME**) (Offered in Semester VI for **CSE, IT, MECH, Mechatronics**)
2	U19HSO52 / U19HSO62	Intellectual Property and Rights	MBA	
3	U19HSO53 / U19HSO63	Marketing Management and Research	MBA	
4	U19HSO54 / U19HSO64	Project Management for Engineers	MBA	
5	U19HSO55 / U19HSO65	Finance for Engineers	MBA	
Open Elective – II / Open Elective – III (Offered in Semester V for **CSE, IT, MECH, Mechatronics**) (Offered in Semester VI for **EEE, ECE, ICE, CIVIL, BME**)				
1	U19EEO53 / U19EEO63	Conventional and Non-Conventional Energy Sources	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics
2	U19EEO54 / U19EEO64	Industrial Drives and Control	EEE	ECE, ICE, MECH, Mechatronics
3	U19ECO53 / U19ECO63	Electronic Product Design and Packaging	ECE	EEE, CSE, IT, ICE MECH, BME, Mechatronics
4	U19ECO54 / U19ECO64	Automotive Electronics	ECE	EEE, ECE, ICE, MECH
5	U19CSO54 / U19CSO64	Platform Technology	CSE	EEE, ECE, ICE, MECH, CIVIL, BME
6	U19CSO55 / U19CSO65	Graphics Designing	CSE	EEE, ECE, ICE, MECH, CIVIL, BME
7	U19ITO53 / U19ITO63	Essentials of Data Science	IT	EEE, ECE, ICE, MECH, CIVIL, BME
8	U19ITO54 / U19ITO64	Mobile App Development	IT	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
9	U19ITO55 / U19ITO65	Data Structures	IT	MECH

10	U19ICO53 / U19ICO63	Fuzzy logic and neural networks	ICE	CSE, IT, CIVIL, BME
11	U19ICO54 / U19ICO64	Measurement and Instrumentation	ICE	ECE, Mechatronics
12	U19MEO54 / U19MEO64	Heating, ventilation and air conditioning system (HVAC)	MECH	EEE, ECE, ICE, CIVIL
13	U19MEO55 / U19MEO65	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME, Mechatronics
14	U19CEO53 / U19CEO63	Disaster Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
15	U19CEO54 / U19CEO64	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
16	U19BMO53 / U19BMO63	Biometric Systems	BME	EEE, ECE, CSE, IT, ICE, MECH, Mechatronics
17	U19BMO54 / U19BMO64	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, MECH, CIVIL , Mechatronics
18	U19CCO53 / U19CCO63	Network Essentials	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME
19	U19CCO54 / U19CCO64	Web Programming	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U19ADO51 / U19ADO61	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL
21	U19ADO52 / U19ADO62	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME, Mechatronics
Open Elective – IV (Offered in Semester VII)				
1	U19EEO75	Hybrid and Electrical Vehicle	EEE	ECE, Mechatronics , MECH
2	U19EEO76	Electrical Energy Conservation and auditing	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics
3	U19ECO75	IoT and its Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL
4	U19ECO76	Cellular and Mobile Communications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, BME, Mechatronics
5	U19CSO76	Artificial Intelligence	CSE	EEE, ICE, CIVIL, MECH
6	U19CSO77	Cloud Technology and its Applications	CSE	EEE, ICE, MECH, CIVIL, BME, Mechatronics
7	U19ITO76	Automation Techniques & Tools-DevOps	IT	EEE, ECE, ICE, CSE, MECH, CIVIL, BME, Mechatronics

8	U19ITO77	Augmented and Virtual Reality	IT	EEE, ICE, MECH, CIVIL, BME
9	U19ICO75	Process Automation	ICE	EEE, ECE, CSE, MECH, IT, CIVIL, BME, Mechatronics.
10	U19ICO76	Virtual Instrumentation	ICE	EEE, ECE, MECH, Mechatronics
11	U19MEO76	Principles of Hydraulic and Pneumatic System	MECH	EEE, ECE, ICE, CIVIL
12	U19MEO77	Supply Chain Management	MECH	EEE, ECE, CIVIL, Mechatronics
13	U19CEO75	Energy Efficient Buildings	CIVIL	EEE, ECE, MECH
14	U19CEO76	Global Warming and Climate Change	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
15	U19MCO71	Building Automation	Mechatronics	MECH, CIVIL
16	U19MCO72	Automation in Manufacturing Systems	Mechatronics	MECH, CIVIL
17	U19BMO75	Internet of Things for Healthcare	BME	EEE, ECE, ICE
18	U19BMO76	Telehealth Technology	BME	EEE, ECE, ICE
19	U19CCO75	Data Science using python	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME,
20	U19CCO76	Mobile Applications Development using Android	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME,
21	U19ADO73	Data Science Application of NLP	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME, Mechatronics
22	U19ADO74	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME

ANNEXURE – III

EMPLOYABILITY ENHANCEMENT COURSES – (A) CERTIFICATION COURSES

Sl. No.	Course Code	Course Title
1.	U19CSCX1	Web Programming – I
2.	U19CSCX2	Python Programming
3.	U19CSCX3	Java Programming
4.	U19CSCX4	CCNA
5.	U19CSCX5	Android Development
6.	U19CSCX6	Software Testing
7.	U19CSCX7	Internet of Things
8.	U19CSCX8	Blockchain
9.	U19CSCX9	Artificial Intelligence and Edge Computing

ANNEXURE – IV

EMPLOYABILITY ENHANCEMENT COURSES - (B) SKILL DEVELOPMENT COURSES

Sl. No.	Course Code	Course Title
1.	U19CSS31	Skill Development Course 1: General Proficiency – I
2.	U19CSS32	Skill Development Course 2 * 1) Computer Assembly and Troubleshooting 2) Aptitude - I 3) Electronic Devices and Circuits
3.	U19CSS41	Skill Development Course 3 : General Proficiency – II
4.	U19CSS42	Skill Development Course 4* 1) Exploring Photoshop 2) Aptitude - II 3) Office Automation
5.	U19CSS51	Skill Development Course 4 : Foreign Language/ IELTS -I
6.	U19CSS52	Skill Development Course 5 : Presentation Skills using ICT
7.	U19CSS61	Skill Development Course 6 : Foreign Language/ IELTS - II
8.	U19CSS62	Skill Development Course 7 : Technical Seminar
9.	U19CSS63	Skill Development Course 8 : NPTEL / MOOC - I
10.	U19CSS81	Skill Development Course 9 : NPTEL / MOOC-II

**** Any one course to be selected from the list***

SEMESTER I

T101

MATHEMATICS – I

(Common to all Branches)

L	T	P	C	Hrs
3	1	0	4	60

Course Objectives

- To introduce the idea of applying calculus concepts to problems in Engineering.
- To understand the concept of partial differentiation
- To develop logical thinking and analytic skills in evaluating multiple integrals.
- To introduce mathematical tools to solve first order differential equations.
- To learn linear differential equations of higher order with constant coefficients.

Course Outcomes

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

CO1 – Understand the concept of curvature. **(K2)**
CO2 – Solve different types of partial differential equation. **(K3)**
CO3 – Understand the concept of double and triple integrals. **(K2)**
CO4 – Solve differential equations. **(K3)**
CO5 – Solve higher order differential equations. **(K3)**

UNIT I CALCULUS (12 Hrs)

Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.

UNIT II FUNCTIONS OF SEVERAL VARIABLES (12 Hrs)

Partial derivatives, Total derivatives, Differentiation of implicit functions, Change of Variables, Jacobians and their properties, Taylor's series for functions of two variables, Maxima and minima, Lagrange's method of undetermined multipliers.

UNIT III MULTIPLE INTEGRALS AND APPLICATIONS (12 Hrs)

Multiple Integrals, change of order of integration and change of variables in double integrals (Cartesian to polar). Applications: Areas by double integration and volumes by triple integration (Cartesian and polar).

UNIT IV DIFFERENTIAL EQUATIONS (12 Hrs)

Exact equations, First order linear equations, Bernoulli's equation, orthogonal Trajectories, growth, decay and geometrical applications. Equations not of first degree: Equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT V DIFFERENTIAL EQUATIONS (Higher order) (12 Hrs)

Linear differential equations of higher order - with constant coefficients, the operator D, Euler's linear equation of higher order with variable coefficients, simultaneous linear Differential equations, solution by Variation of parameters method simple application to Electric circuits.

Text Books

1. Venkataraman M.K, Engineering Mathematics-First year, National Publishing Company, Chennai, 2010
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 41st Edition, 2011.

Reference Books

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. Kandasamy P. et al, Engineering Mathematics, Vol.1 & 2, S. Chand & Co., New Delhi.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New Delhi, 8th Edition.
5. Bali N.P and Goyal M., Advanced Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2010.

Web References

1. https://www.youtube.com/watch?v=rAof9Ld5sOg
2. https://nptel.ac.in/courses/111/104/111104092/
3. https://nptel.ac.in/courses/111/107/111107108/
4. https://www.youtube.com/watch?v=BJ_0FURo9RE
5. https://www.youtube.com/watch?v=p_di4Zn4wz4

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	1	-	-	-	-	1	2	1	1
2	3	2	1	1	-	1	1	-	-	-	-	1	2	1	1
3	2	1	-	-	-	-	-	-	-	-	-	1	2	1	1
4	3	2	1	1	-	1	1	-	-	-	-	1	2	1	1
5	3	2	1	1	-	1	1	-	-	-	-	1	2	1	1

Correlation Level: 1-Low, 2-Medium, 3- High

T102

PHYSICS

(Common to all Branches)

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To understand the concepts of physics and its significant contributions in the advancement of technology and invention of new products that dramatically transformed modern-day society.
- To expose the students to different areas of physics which have direct relevance and applications to different Engineering disciplines
- To understand the concepts and applications of Ultrasonics, optics and some optical devices, Lasers and Fiber optics, Nuclear energy sources and wave mechanics

Course Outcomes

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

CO1 - Understand the basic concepts of sound Engineering and ideas to get good audibility inside a hall. Also gain knowledge about the production, propagation, properties and application of ultrasonic waves. **(K2)**

CO2 - Interpret the different characteristic behavior of light waves with air, glass, lens, grating, prism etc., Gain adequate knowledge about the interference, diffraction and polarization phenomenon of light waves and their applications**. (K2)**

CO3 - Understand the principle mechanism of laser light; distinguish between ordinary light and laser light. Basic idea about the various laser sources. Also gain knowledge about the optical fibers and their importance in communication. **(K3)**

CO4 - Understand the basic concept of quantum mechanics, dual nature of matter, and importance of energy of electrons associated with the properties of the materials. Also able to calculate energy of electron in an energy level by solving Schrodinger's equation. **(K1)**

CO5 - Gain knowledge about the structure of nucleus its constituents, nature. Understanding the nuclear energy fission and fusion concepts. Basic ideas of nuclear reactors to produce energy. **(K3)**

UNIT I ACOUSTICS & NDT (12 Hrs)

ultrasonics - Ultrasonic Waves Productions (Piezoelectric & Magnetostriction method) – Detections (Acoustic Grating) NDT applications – Ultrasonic Pulse Echo Method - Liquid Penetrant Method

Acoustics - Factors affecting Acoustic of Buildings (Reverberation, Loudness, Focusing, Echo, Echelon Effect and Resonance) and their Remedies - Sabine's formula for Reverberation Time – Doppler effect and its application to Radars. (elementary ideas)

UNIT II OPTICS (12 Hrs)

Interference - Air Wedge – Michelson's Interferometer - Wavelength Determination – Interference Filter – Antireflection Coatings

Diffraction - Diffraction Grating – Dispersive power of grating - Resolving Power of Grating & Prism

Polarisation - Basic concepts of Double Refraction - Huygens Theory of Double Refraction- Quarter and Half Wave Plates – Specific Rotary Power – Laurent Half Shade Polarimeter

UNIT III LASERS & FIBER OPTICS (12 Hrs)

Lasers - Principles of Laser – Spontaneous and Stimulated Emissions - Einstein's Coefficients – Population Inversion and Laser Action – types of Optical resonators (qualitative ideas) – Types of Lasers - NdYAG, CO_2 laser, GaAs Laser - applications of lasers

Fiber Optics - Principle and Propagation of light in optical fiber – Numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode) - applications to sensors and Fibre Optic Communication

UNIT IV WAVE MECHANICS (12 Hrs)

Matter Waves – de Broglie Wavelength – Uncertainty Principle – Schrödinger Wave Equation – Time Dependent – Time Independent – Application to Particle in a One Dimensional potential Box – Quantum Mechanical Tunneling – Tunnel Diode.

UNIT V NUCLEAR ENERGY SOURCE (12 Hrs)

General Properties of Nucleus (Size, Mass, Density, Charge) – Mass Defect – Binding Energy - Disintegration in fission – Nuclear Reactor: Materials Used in Nuclear Reactors. – PWR – BWR – FBTR. Nuclear fusion reactions for fusion reactors - D-D and D-T reactions, Basic principles of Nuclear Fusion reactors.

Text Books

1. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi, 2011. (For units I to IV only)
2. Arthur Beiser, Concepts of Modern Physics, 6th Edition, TMH, New Delhi 2008. (For unit V only)

Reference Books

1. Ajoy Ghatak, Optics, 5th Edition TMH, New Delhi, 2012.
2. K. Thyagarajan and Ajoy Ghatak, Lasers Fundamentals and Applications, 2nd Edition, Springer 2010.
3. R. Murugesan, Modern Physics, S. Chand & Co, New Delhi 2006.
4. K.R.Nambiar, Lasers, New Age International, New Delhi, 2008.
5. Science of Engineering Materials, 2nd Edition, C.M. Srivastava and C. Srinivasan, New Age Int. (P) Ltd, New Delhi, 1997.
6. Avadhanulu M N, Engineering Physics, S. Chand & Co, 2009.

Web References

1. https://swayam.gov.in/nd1_noc20_ph15/preview
2. https://swayam.gov.in/nd1_noc20_ph22/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	3	-	-	-	-	-	-	-	1	3	1
2	3	3	2	2	3	-	-	-	-	-	-	-	1	2	3
3	3	3	2	3	3	-	-	-	-	-	-	-	2	2	3
4	3	3	3	3	2	-	-	-	-	-	-	-	2	-	-
5	3	3	3	1	3	-	-	-	-	-	-	-	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

T103

CHEMISTRY

(Common to all Branches)

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- Know the fundamental principles of Engineering Chemistry required solving engineering problems.
- Practical implementation of fundamental theory concepts.
- Introducing new techniques and latest information that motivates the students to bring out his or her views and work effectively.
- To enable the students understand the role of engineering materials such as polymers, energy production, electrical field basic concepts of material behaviour and study the environmental applications in the field of engineering and technology
- To acquire knowledge of engineering materials and about fuels and batteries

Course Outcomes

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

CO1 - Understand the basic concept of hardness of water, the chemicals responsible for it, measurement of hardness, its disadvantages and its removal. **(K2)**

CO2 - Understand the synthesis of various organic and inorganic polymer **(K3)**

CO3 - Understand the application of the concept of oxidation and reduction reaction to various cells **(K2)**

CO4 - Understand the application of electrochemistry in corrosion of metals and also about different types of corrosion control methods **(K3)**

CO5 - Understand the concept of phase equilibrium and its application to different types of heterogeneous equilibrium system like eutectic alloys. **(K3)**

UNIT I WATER

(12 Hrs)

Hardness of water - units and calcium carbonate equivalent. Determination of hardness of water – EDTA method. Disadvantages of hardwater – boiler scale and sludge, caustic embrittlement, priming & foaming and boiler corrosion. Water softening methods – internal & external conditioning – Lime-Soda process, Zeolite process and Ion-exchange process. Desalination – reverse osmosis & electrodialysis.

UNIT II POLYMER

(12 Hrs)

Classification, types of polymerization reactions – mechanism of radical, ionic and Ziegler-Natta polymerizations. Polymerproperties –chemical resistance, crystallinity and effect of temperature, Mn and Mw. Thermoplastics and thermosets. Preparation, properties and uses of PVC, TEFLON, Nylons, Bakelite, Polyurithane, Rubbers– vulcanization, synthetic rubber,BuNa-S, BuNa-N, silicone and butyl rubber. Conducting polymers–classification and applications. Polymer composites – FRP – laminar composites. Moulding constituents of plastic, moulding techniques – compression, injection, transfer and extrusion moulding.

UNIT III ELECTROCHEMICAL CELLS

(12 Hrs)

Galvanic cells, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes–hydrogen, calomel, Ag/AgCl & glass electrodes. Batteries – primary and secondary cells, Leclanche cell, Lead acid storage cell, Ni-Cd battery & alkaline battery. Fuel cells – H_2-O_2 fuel cell

UNIT IV CORROSION AND ITS CONTROL

(12 Hrs)

Chemical & electrochemical corrosion – Galvanic, pitting, stress and concentration cell corrosion. Factors influencing corrosion – corrosion control methods – cathodic protection and corrosion inhibitors. Protective coating – types of protective coatings – metallic coating–tinning and galvanizing, cladding, electroplating and anodizing

UNIT V PHASE RULE

(12 Hrs)

Definition and derivation of phase rule. Application to one component system – water and sulfur systems. Thermal analysis, condensed phase rule. Two component systems– Pb-Ag, Cu-Ni, and Mg-Zn systems.

Text Books

1. P.C. Jain and Monika Jain, Engineering Chemistry, DhanpatRai and Sons, New Delhi 15th Ed,2010.
2. B.Sivasankar (2008) , "Engineering Chemistry ", Tata McGraw Hill , India
3. Shaley Oberoi & Monica Malik (2009), "Engineering Chemistry made easy", Cengage Learning, Delhi.
4. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, New Delhi. (2016)

5. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)

Reference Books

1. S. S. Dara, A Textbook of Engineering Chemistry, 11th Ed, S.Chand& Co., Ltd. New Delhi, 2008.
2. B. K. Sharma, Engineering Chemistry, 3rd edition Krishna Prakashan Media (P) Ltd., Meerut, 2001.
3. P. Kannan and A. Ravi Krishnan "Engineering Chemistry" Hi-Tech Sri Krishna Publications, Chennai, 9th Ed, 2009
4. N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry, 2nd Ed. PHI Learning PVT., LTD, New Delhi, 2008
5. C.V.Agarwal, C.P.Naidu, "A text book of Engineering Chemistry", BS Publication, Hyderabad.

Web References

1. https://water.usgs.gov/edu/hardness.html
2. https://www.polymer-project.org/
3. www.materials.unsw.edu.au/tutorials/online-tutorials/corrosion
4. www.electrochem.org/redcat-blog/4-useful-electrochemistry-websites-2/
5. https://serc.carleton.edu/research_education/equilibria/phaserule.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	1	-	-	-	-	1	-	1	-
2	2	1	-	-	-	1	1	-	-	-	-	1	3	1	-
3	2	1	-	-	-	1	1	-	-	-	-	1	3	1	-
4	2	1	-	-	-	1	1	-	-	-	-	1	1	1	-
5	2	1	-	-	-	1	1	-	-	-	-	1	2	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

T104

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to all Branches)

L	T	P	C	Hrs
3	1	0	4	60

Course Objectives

- To understand and gain basic knowledge about magnetic and electrical circuits
- To gain basic knowledge about single phase and three phase power measurement
- To understand the operating principles of stationary and rotating machines
- To understand the characteristics and applications of semiconductor devices
- To provide the basic knowledge in Digital electronics
- To understand the purpose of communication and acquire knowledge on different communication systems

Course Outcomes

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

CO1 - Analyze the basic concepts, various laws and theorems used in DC circuits. **(K3)**

CO2 - Analyze and solve the AC circuits and develop resonance circuits for transmitter and receiver. **(K4)**

CO3 - Gain the knowledge of power production in power system and application of transformers and motors in real time. **(K2)**

CO4 - Understand the operations of semiconductor diode, BJT, FET and its applications. **(K2)**

CO5 - Summarize the digital electronics concepts for sequential and combinational circuits. **(K2)**

CO6 - Explain and Relate different Communication Systems. **(K2)**

PART A – ELECTRICAL

UNIT I DC CIRCUITS (10 Hrs)

Definition of Voltage, Current, Power & Energy, circuit parameters, Ohm's law, Kirchoff's law & its applications – Simple Problems - Division of current in Series & parallel circuits - star/delta conversion - Node and mesh methods of analysis of DC circuits

UNIT II AC CIRCUITS (10 Hrs)

Concepts of AC circuits – rms value, average value, form and peak factors – Simple RLC series circuits – Concept of real and reactive power – Power factor - Introduction to three phase system - Power measurement by two wattmeter method

UNIT III ELECTRICAL MACHINES AND POWER PLANTS (10 Hrs)

Law of Electromagnetic induction, Fleming's Right & Left hand rule - Principle of DC rotating machine, Single phase transformer and single phase induction motor (Qualitative approach only) - Simple layout of thermal and hydro generation (block diagram approach only).Fundamentals of fuses and circuit breakers.

PART B – ELECTRONICS

UNIT IV ELECTRONIC CIRCUITS (10 Hrs)

V-I Characteristics of diode - Half-wave rectifier and Full-wave rectifier – with and without capacitor filter - Transistor - Construction & working - Input and output characteristics of CB and CE configuration - Transistor as an Amplifier - Principle and working of Hartley oscillator and RC phase shift oscillator - Construction and working of JFET & MOSFET.

UNIT V DIGITAL ELECTRONICS (10 Hrs)

Boolean algebra – Reduction of Boolean expressions - De-Morgan's theorem - Logic gates -Implementation of Boolean expressions - Flip flops - RS, JK, T and D. Combinational logic - Half adder, Full adder and Subtractors. Sequential logic - Ripple counters and shift registers.

UNIT VI COMMUNICATION AND COMPUTER SYSTEMS (10 Hrs)

Model of communication system - Analog and digital - Wired and wireless channel. Block diagram of various communication systems - Microwave, satellite, optical fiber and cellular mobile system. Network model - PAN, LAN, MAN and WAN - Circuit and packet switching - Overview of ISDN.

Text Books

1. Kothari D P and Nagrath I J , Basic Electrical Engineering, Tata McGraw Hill,2009.(For Units I to III)
2. Rajendra Prasad, "Fundamentals of Electronic Engineering", Cengage learning, New Delhi, First Edition, 2011. (For Unit IV)
3. Morris Mano, "Digital design", PHI Learning, Fourth Edition, 2008. (For Unit V)
4. Wayne Tomasi, "Electronic Communication Systems- Fundamentals Theory Advanced", Sixth Edition, Pearson Education, 2004. (For Unit VI)

Reference Books

1. R.Muthusubramaniam, S.Salivahanan and K.A. Mureleedharan, Basic Electrical Electronics and Computer Engineering, Tata McGraw Hill, 2004.
2. J.B.Gupta, A Course in Electrical Power, Katson Publishing House, New Delhi, 1993.
3. David. A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, India, Fourth Edition, 2008
4. Donald P Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications," 6th edition,Tata McGraw Hill Publishing Company Ltd.,New Delhi,2008.
5. S.K. Sahdev, Fundamentals of Electrical Engineering and Electronics, Dhanpat Rai & Co, 2013.
6. Jacob Millman and Christos C. Halkias, "Electronic Devices and Circuits" Tata McGraw Hill
7. R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Private Limited, Ninth Edition, 2008
8. M.S.Sukija and T.K.Nagasarkar, "Basic electrical and Electronics Engineering", Oxford University Press, 2012.

Web References

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://www.electrical4u.com/
3. https://nptel.ac.in/courses/108/102/108102146/
4. http://electrical-engineering-portal.com/
5. http://www.electronics-tutorials.ws
6. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
7. https://nptel.ac.in/courses/117/102/117102059/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	3	-	-	-	-	-	-	-	3	3	3
2	3	3	2	2	3	-	-	-	-	-	-	-	3	3	3
3	3	3	2	2	3	-	-	-	-	-	-	-	3	3	3
4	3	1	2	2	-	-	-	-	-	-	-	-	3	3	3
5	3	2	2	2	-	-	-	-	-	-	-	-	2	3	2
6	3	-	2	-	-	-	-	-	-	-	-	-	1	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

T105

ENGINEERING THERMODYNAMICS

(Common to all Branches)

L	T	P	C	Hrs
3	1	0	4	60

Course Objectives

- To understand the basics of the thermodynamic principles
- To establish the relationship of these principles to thermal system behaviors
- To develop methodologies for predicting the system behavior
- To establish the importance of laws of thermodynamics applied to energy systems
- To explain the role of refrigeration and heat pump as energy systems and develop an intuitive understanding of underlying physical mechanism and a mastery of solving practical problems in real world

Course Outcomes

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

CO1 - Understand the fundamental thermodynamic concepts and its basic laws. **(K2)**

CO2 - Apply first law of thermodynamics concepts to calculate the system work for closed and open systems. **(K3)**

CO3 - Apply Second Law of Thermodynamics and entropy concepts to evaluate the performance of heat engine, heat pump and refrigerator.**(K3)**

CO4 - Apply the principles of gas power cycles to calculate its thermal performance. **(K3)**

CO5 - Understand the basic working principle of refrigeration systems. **(K2)**

UNIT I BASIC CONCEPTS AND DEFINITIONS (12 Hrs)

Energy conversion and efficiencies - system, property and state – Thermal equilibrium – Temperature – Zeroth law of Thermodynamics – Pure substance – P, V and T diagrams – Thermodynamic diagrams.

UNIT II FIRST LAW OF THERMODYNAMICS (12 Hrs)

The concept of work and adiabatic process – First law of thermodynamics – conservation of Energy Principle for closed and open systems – Calculation of work for different processes of expansion of gases

UNIT III SECOND LAW OF THERMODYNAMICS (12 Hrs)

Equilibrium and the second law – Heat engines – Kelvin-Plank statement of second law of thermodynamics – Reversible and irreversible processes – Carnot principle – Clausius inequality – Entropy

UNIT IV GAS POWER CYCLES (12 Hrs)

Air standard cycles: The air standard carnot cycle – Air standard Otto cycle, Diesel cycle, Dual cycle and Brayton cycles and their efficiencies

UNIT V REFRIGERATION CYCLES AND SYSTEMS (12 Hrs)

Reverse Carnot cycle – COP – Vapor compression refrigeration cycle and systems (only theory) – Gas refrigeration cycle – Absorption refrigeration system – Liquefaction – Solidification (only theory).

Text Books

1. P.K.Nag, "Engineering Thermodynamics", 4th edition, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi, 2008.
2. R. K. Singal, Mridul Singal "A text book of Engineering Thermodynamics", I.K. International Publishing House Pvt. Limited, 2010.
3. Er.S.K.Gupta, "Engineering Thermodynamics", S. Chand publishers, 2013.

Reference Books

1. Arora, C.P., "Thermodynamics", Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi, 2010.
2. Burghardt, M.D., "Engineering Thermodynamics with Applications", 4th edition, Harper & Row, N.Y., 2009.
3. Huang, F.F., "Engineering Thermodynamics" 2nd edition, Macmillan Publishing Co. Ltd., N.Y., 2011.
4. Cengel, Y.A. and Boles, M.A., "Thermodynamics – An Engineering approach", 5th edition, Mc Graw Hill, 2008.
5. Wark, K., "Thermodynamics", 4th edition Mc-Graw Hill, N.Y., 2009.

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1. https://nptel.ac.in/courses/112105266/
2. https://nptel.ac.in/courses/112108148/
3. https://nptel.ac.in/courses/112/103/112103275/
4. https://www.linkedin.com/company/heat-transfer-and-process-design-htpd
5. https://www.udemy.com/course/an-introduction-to-heat-transfer/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	-	-	-	-	-	-	1	-	2	-
2	3	2	2	2	2	-	-	-	-	-	-	1	-	1	-
3	3	2	3	3	2	-	-	-	-	-	-	1	-	1	-
4	3	2	3	3	-	-	-	-	-	-	-	1	-	2	-
5	3	2	3	3	-	-	-	-	-	-	-	1	-	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

T106

COMPUTER PROGRAMMING

(Common to all Branches)

L	T	P	C	Hrs
3	1	0	4	60

Course Objectives

- To introduce the basics of computers and information technology.
- To educate problem solving techniques.
- To impart programming skills in C language.
- To practice structured programming to solve real life problems.
- To study the basic concepts of File operations.

Course Outcomes

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

CO1 - Identify and understand the working components of a computer system. **(K1)**

CO2 - Understand, analyze and implement like algorithm, pseudo codes and programming structures. **(K2)**

CO3 - Analyze and make use of logical structure of a C program. **(K3)**

CO4 - Make use of pointers, memory allocation and data handling to implement C programs. **(K3)**

CO5 - Understand the working of files and directives. **(K3)**

UNIT I INTRODUCTION TO COMPUTERS (12 Hrs)

History of Computers – Block diagram of a Computer – Components of a Computer system –Classification of computers - Hardware – Software – Categories of Software – Operating System – Applications of Computers – Network structure – Internet and its services – Intranet – Study of word processor – Preparation of worksheets.

UNIT II INTRODUCTION TO C (12 Hrs)

Problem solving techniques – Program – Program development cycle – Algorithm design– Flowchart - Pseudo code.

Introduction to C – History of C – Importance of C - C tokens – data types – Operators and expressions – I/O functions.

UNIT III DECISION MAKING AND ARRAYS (12 Hrs)

Decision making statements – branching and looping – arrays – multidimensional arrays– Functions – Recursion – Passing array to functions. Storage classes – Strings – String library functions.

UNIT IV STRUCTURES AND POINTERS (12 Hrs)

Structures – Arrays and Structures – nested structures – passing structures to functions – user defined data types – Union. Pointers – pointers and arrays – pointers and functions - pointers and strings - pointers and Structures.

UNIT V FILE MANAGEMENT AND PREPROCESSORS (12 Hrs)

Files – operations on a file – Random access to files – command line arguments. Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives.

Text Books

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, Sixth edition, 2012.
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Kenneth A. Reek, "Pointers on C", Pearson Education, 2007.

Reference Books

1. Vikas Verma, "A Workbook on C ", Cengage Learning, Second Edition,2012.
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2008.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
4. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.
5. Stephen G. Kochan, "Programming in C", Third Edition, Pearson Education, 2007

Web References

1. https://www.geeksforgeeks.org/classification-of-computers/
2. http://www.btechsmartclass.com/c_programming/C-Program-Development-Life-Cycle.html
3. https://www.learn-c.org/en/Multidimensional_Arrays
4. https://www.tutorialspoint.com/cprogramming/c_structures.htm
5. https://www.w3schools.in/c-tutorial/command-line-arguments/

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	2	1	-	-	3	-	-	-	-	-	-	-	2	1	3
2	2	1	-	-	3	-	-	-	-	-	-	-	2	1	3
3	3	2	1	1	3	-	-	-	-	-	-	-	2	1	3
4	3	2	1	1	3	-	-	-	-	-	-	-	2	1	3
5	3	2	1	1	3	-	-	-	-	-	-	-	2	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

P101

COMPUTER PROGRAMMING LABORATORY

(Common to all Branches)

L	T	P	C	Hrs
0	0	3	2	45

Course Objectives

- To study and understand the use of OS commands
- To gain a hands on experience of compilation and execution of 'C' programs
- To understand the working of control statements
- To design functional methods.
- To make use pointers in various programs

Course Outcomes

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

CO1 - Apply and practice logical ability to solve the problems. Understand C programming development. environment, compiling. debugging, linking and executing a program using the development environment.**(K2)**

CO2 - Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs.**(K2)**

CO3 - Understand and apply the in-built functions and customized functions for solving the problems. **(K3)**

CO4 - Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems. **(K3)**

CO5 - Document and present the algorithm's, flowcharts and programs in form of user-manuals. **(K3)**

List of Exercises

1. Study of OS Commands
2. Write a simple C program to find the Area of the triangle.
3. Write a simple C program to find the total and average percentage obtained by a student for 6 subjects.
4. Write a simple C program to read a three digit number and produce output like
   1 hundreds
   7 tens
   2 units
   for an input of 172.
5. Write a simple C program to check whether a given character is vowel or not using Switch – Case statement.
6. Write a simple C program to print the numbers from 1 to 10 along with their squares.
7. Write a simple C program to find the sum of 'n' numbers using for, do – while statements.
8. Write a simple C program to find the factorial of a given number using Functions.
9. Write a simple C program to swap two numbers using call by value and call by reference.
10. Write a simple C program to find the smallest and largest element in an array.
11. Write a simple C program to perform matrix multiplication.
12. Write a simple C program to demonstrate the usage of Local and Global variables.
13. Write a simple C program to perform various string handling functions: strlen, strcpy, strcat, strcmp.
14. Write a simple C program to remove all characters in a string except alphabets.
15. Write a simple C program to find the sum of an integer array using pointers.
16. Write a simple C program to find the Maximum element in an integer array using pointers.

17. Write a simple C program to create student details using Structures.
18. Write a simple C program to display the contents of the file on the monitor screen.
19. Create a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.
20. Write a simple C program to pass the parameter using command line arguments.

Reference Books

1. VikasVerma, "A Workbook on C ", Cengage Learning, Second Edition, 2012
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2008.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
4. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007
5. Stephen G. Kochan, "Programming in C", Third Edition, Pearson Education, 2007

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1. https://www.javatpoint.com/factorial-program-in-c
2. https://www.studytonight.com/c/programs/array/largest-and-smallest-element-in-array
3. https://www.programiz.com/c-programming/examples/information-structure-array
4. https://www.geeksforgeeks.org/c-program-print-contents-file/
5. https://www.studytonight.com/c/command-line-argument.php

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	2	1	3
2	2	1	-	-	3	-	-	-	-	-	-	-	2	1	3
3	3	2	1	1	3	-	-	-	-	-	-	-	2	1	3
4	3	2	1	1	3	-	-	-	-	-	-	-	2	1	3
5	3	2	1	1	3	-	-	-	-	-	-	-	2	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

P102

ENGINEERING GRAPHICS

(Common to all Branches)

L	T	P	C	Hrs
2	0	3	2	60

Course Objectives

- To convey the basics of engineering drawing
- To explain the importance of an engineering drawing
- To teach different methods of making the drawing
- To establish the importance of projects and developments mode in drawing that are used in real systems
- To develop the role of computer aided design Auto Cad and significance of using these drawings

Course Outcomes

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

CO1 - Understand the basic concepts of engineering drawings. **(K2)**

CO2 - Apply various concepts like dimensioning, conventions and BIS codes, the theory and methods of projection. **(K3)**

CO3 - Improve their imagination and visualization skills to design new products. **(K4)**

CO4 - Create engineering drawing of physical object representing engineering systems. **(K4)**

CO5 - Analysis the different views and computer aided drafting tools. **(K3)**

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning

UNIT I

(12 Hrs)

Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and planes

UNIT II

(12 Hrs)

Projection of Solids and Sections of solids.

UNIT III

(12 Hrs)

Development of surfaces – Intersection of surfaces (Cylinder-Cylinder, cylinder-cone)

UNIT IV

(12 Hrs)

Isometric projections and Orthographic projections

UNIT V

(12 Hrs)

Computer Aided Drafting: Introduction to computer Aided Drafting hardware- overview of application software – 2D drafting commands (Auto CAD) for simple shapes – Dimensioning.

Text Books

1. K.R. Gopalakrishna and Sudhir Gopalakrishna, Engineering Graphics, Inzinc Publishers, 2007.
2. Dhananjayan A. Jolhe, Engineering Drawing with introduction to Autocad, Tata McGrawHill Publishing company Limited, 2008.
3. Basant Agrwal and Agarwal C W., Engineering Drawing, Tata Tata McGrawHill Publishing company limited, 2008.

Reference Books

1. N.D. Bhatt, Engineering Drawing, 49th edition, Chorotar Publishing House, 2006.
2. K. Venugopal, Engineering Drawing and Graphics + Auto CAD, 4th edition, New Age International Publication Ltd., 2004.
3. David I cook and Robert N Mc Dougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn. 1985.
4. James D Bethune and et. al., Modern Drafting, Prentice Hall Int., 1989.
5. K.V. Natarajan, A Text Book of Engineering Drawing, Dhanalakshmi Publishers, 2006.
6. BIS, Engineering Drawing practice for Schools & Colleges, 1992.

Web References

1. http://nptel.ac.in/courses/112103019
2. https://en.wikipedia.org/wiki/Engineering drawing
3. https://nptel.ac.in/courses/105/104/105104148/
4. https://onlinecourses.nptel.ac.in/noc20_me79/preview
5. https://www.btechguru.com/courses--nptel--engineering-drawing----video-lecture.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	-	-	-	3	-	-	-
2	3	1	-	-	3	-	-	-	-	-	-	3	-	-	-
3	3	1	-	-	3	-	-	-	-	-	-	3	-	-	-
4	3	1	-	-	3	-	-	-	-	-	-	3	-	-	-
5	3	1	-	-	3	-	-	-	-	-	-	3	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

P103

BASIC ELECTRICAL AND ELECTRONICS LABORATORY

(Common to all Branches)

L	T	P	C	Hrs
0	0	3	2	45

Course Objectives

- To get an exposure on the basic electrical tools, applications and precautions
- To gain training on different types of wiring used in domestic and industrial applications.
- To detect and find faults in electrical lamp and ceiling fan
- To get an exposure on the measurements of voltage and phase using CRO, basic operation and applications devices such as PN junction diode and transistor
- To gain a practical knowledge on the functions and application of basic logic gates and flip flops

Course Outcomes

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

CO1 - Follow the safety procedures when working with electricity and various tools. **(K4)**

CO2 - Do line diagram and wiring practices for domestic application. **(K5)**

CO3 - Use the protection circuits for electrical networks. **(K3)**

CO4 - Design and verify the kirchoff's law. **(K4)**

CO5 - Analyze the characteristics of PN diode and use it for rectifier applications. **(K4)**

CO6 - Gain knowledge on digital electronics to solve problems related to boolean algebra. **(K4)**

ELECTRICAL LAB

List of Experiments

1. Electrical Safety, Precautions, study of tools and accessories.
2. Practices of different joints.
3. Wiring and testing of series and parallel lamp circuits.
4. Staircase wiring.
5. Doctor's room wiring.
6. Bed room wiring.
7. Go down wiring.
8. Wiring and testing a ceiling fan and fluorescent lamp circuit.
9. Study of different types of fuses, circuits breakers and A.C and D.C meters.

ELECTRONICS LAB

List of Experiments

1. Study of CRO
    (a) Measurement of AC and DC voltages
    (b) Frequency and phase measurements (using Lissajou's figures)
2. Verification of Kirchoff's Voltage and Current Laws
    Determine the voltage and current in given circuits using Kirchoff's laws theoretically and verify the laws experimentally.
3. Characteristics and applications of PN junction diode.
    Forward and Reverse characteristics of PN junction diode.
    Application of Diode as Half wave Rectifier – Measurement of ripple factor with and without capacitor filter
4. Frequency Response of RC Coupled Amplifiers
    Determination of frequency response of given RC coupled amplifier - Calculation of bandwidth.
5. Study of Logic Gates
    (a) Verification of Demorgan's theorems
    (b) Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR gates and Flipflops - JK, RS, T and D
    (c) Implementation of digital functions using logic gates and Universal gates.

Reference Books

1. Kothari D P and Nagrath I J, Basic Electrical Engineering, Tata McGraw Hill, 2009.
2. R.Muthusubramaniam, S.Salivahanan and K.A. Mureleedharan, Basic Electrical Electronics and Computer Engineering, Tata McGraw Hill, 2004
3. Sudhakar and S. P. Shyam Mohan, "Circuits and Networks Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th Edition, 2010.
4. Rajendra Prasad, "Fundamentals of Electronic Engineering", Cengage learning, New Delhi, First Edition, 2011.
5. Donald P Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications," 6th edition, Tata McGraw Hill Publishing Company Ltd.,New Delhi,2008
6. Morris Mano, "Digital design", PHI Learning, Fourth Edition, 2008
7. Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith, "Electrical and Electronics Technology", Pearson Education Limited, New Delhi, 10th Edition, 2010.

Web References

1. https://www.electrical4u.com/
2. https://www.allaboutcircuits.com/
3. https://www.circuitlab.com/
4. http://www.electronics-tutorials.ws
5. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
6. https://nptel.ac.in/courses/117/102/117102059/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	3	-	-	-	3	3	3
2	3	3	3	3	3	-	-	-	3	-	-	-	3	3	3
3	3	3	2	3	3	-	-	-	3	-	-	-	3	3	3
4	3	3	2	3	2	-	-	-	3	-	-	-	3	3	3
5	3	3	2	3	2	-	-	-	3	-	-	-	3	3	3
6	3	3	2	3	2	-	-	-	3	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

SEMESTER II

T107

MATHEMATICS – II

(Common to all Branches)

L	T	P	C	Hrs
3	1	0	4	60

Course Objectives

- To familiarize the concept of matrices.
- To introduce the concepts of curl, divergence and integration of vectors in vector calculus
- To equip themselves familiar with Laplace transform
- To solve the differential equations using Inverse Laplace transform techniques.
- To gain good knowledge in application of Fourier transform.

Course Outcomes

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

CO 1 - Understand the concept of Eigen values and Eigen vectors, Diagonalization of a matrix. **(K2)**
CO 2 - Understand the use of vector calculus. **(K2)**
CO 3 - Apply Laplace transform of simple function. **(K3)**
CO 4 - Apply inverse Laplace transform of simple functions**.** **(K3)**
CO 5 - Compute Fourier transforms of various functions. **(K3)**

UNIT I MATRICES (12 Hrs)

Eigen values and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values and Eigenvectors. Cayley-Hamilton Theorem, Diagonalization of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation. Nature of quadratic forms.

UNIT II VECTOR CALCULUS (12 Hrs)

Gradient, divergence and curl, their properties and relations. Gauss divergence theorem and Stoke's theorem (without proof). Simple application problems

UNIT III LAPLACE TRANSFORMS (12 Hrs)

Definition, Transforms of elementary functions, properties. Transform of derivatives and Integrals. Multiplication by t and division by t. Transform of unit step function, transform of periodic functions. Initial and Final value theorems

UNIT IV APPLICATIONS OF LAPLACE TRANSFORM (12 Hrs)

Methods for determining inverse Laplace Transforms, convolution theorem, Application to differential equations and integral equations. Evaluation of integrals by Laplace transforms.

UNIT V FOURIER TRANSFORMS (12 Hrs)

Fourier Integral theorem (statement only), Fourier transform and its inverse, properties. Fourier sine and cosine transforms their properties, convolution and Parseval's identity.

Text Books

1. Venkataraman M.K., Engineering Mathematics, National Publishing Company, Chennai, 2012
2. Kandasamy P. et al, Engineering Mathematics, Vol.2 & 3, S. Chand & Co., New Delhi.

Reference Books

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 1st Edition, 2011.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig Advanced Engineering Mathematics, John Wiley & Sons, New Delhi.
5. Bali N. and Goyal M., Advanced Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2010.

Web References

1. https://www.youtube.com/watch?v=1wjXVdwzgX8
2. http://www.snggdcg.ac.in/pdf/study-material/mathematics/SMch18.pdf
3. https://www.youtube.com/watch?v=MLSfh33ZCwE
4. https://www.khanacademy.org/math/differential-equations/laplace-transform/convolution-integral/v/the-convolution-and-the-laplace-transform
5. http://www-users.math.umn.edu/~mille003/fouriertransform.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	1	-	-	-	-	1	3	2	2
2	2	1	-	-	-	1	1	-	-	-	-	1	3	2	2
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	2
4	3	2	1	1	-	1	-	-	-	-	-	1	3	2	2
5	3	2	1	1	-	1	-	-	-	-	-	1	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

T108

MATERIAL SCIENCE

(Common to all Branches)

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To understand the importance of Material Science as a subject that revolutionized modern day technologies
- To understand the significance of material science in the development of new materials and devices for all branches of Engineering
- To impart knowledge to the Engineering students about some of the important areas of Materials Science so as to enable them perceive the significant contributions of the subject in Engineering and Technology

Course Outcomes

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

CO1 - Identify crystal lattices and their structures, crystalline planes and directions in a crystal lattice in terms of Miller Indices. To interpret X-ray diffraction studies and different types of lattice defects and their impact. **(K2)**

CO2 - Identify the nature of polarization in a dielectric material and to explain the various dielectric material and their characterization. **(K2)**

CO3 - Understand the source of a materials magnetic behaviour and be able to distinguish types of magnetism. Having Basic idea about the read/ write mechanism of various magnetic storage devices. **(K3)**

CO4 - Differentiate semiconductors; calculate the intrinsic carrier concentration in semiconductors.Understand the phenomenon of superconductivity: Student is able to define basic properties of superconducting materials and identify potential areas of their applications. **(K1)**

CO5 - Differentiate between nanomaterials and conventional materials. Have a broad understanding of the techniques used to synthesize nanomaterials, evaluate the properties of nanomaterials, identify the role of nanomaterials in current nanotechnology revolution and be prepared for more advanced courses in Materials Science and Engineering. **(K3)**

UNIT I CRYSTAL STRUCTURE AND LATTICE DEFECTS (12 Hrs)

Crystal structure - Bravais Lattices, Crystal Systems — Coordination Number, Atomic Radius, Packing Factor for FCC & HCP structures – Miller Indices- Powder X Ray Diffraction Method

Lattice defects – Qualitative ideas of point, line, surface and volume defects

UNIT II DIELECTRIC PROPERTIES (12 Hrs)

Dielectric Polarization and Mechanism –Temperature dependence of polarization, Internal or local Field-Clausius-Mossotti relation. Basic ideas of Dielectric loss - frequency dependence of dielectric constant – Measurement of Dielectric constant and loss using Scherring bridge – Elementary ideas of Piezoelectrics, Ferroelectrics and Pyroelectric materials and Applications

UNIT III MAGNETIC PROPERTIES (12 Hrs)

Origin of atomic magnetic moment – Bohr magneton - Elementary Ideas of classification of magnetic materials (Dia, Para, Ferro, antiferro & Ferri). – Quantum theory of Para & Ferro Magnetism – Domain Theory of Hysteresis – Heisenberg Theory of Exchange Interaction (without derivation) – Qualitative ideas of Anti ferromagnetic Ordering – Structure and Properties of Ferrites – Properties of Soft & Hard Magnetic Materials – Applications. Magnetic data storage – Magnetic tapes, Hard disks, Magneto optical recording

UNIT IV SEMICONDUCTORS AND SUPERCONDUCTORS (12 Hrs)

Semiconductors -Derivation of Carrier concentration in intrinsic Semiconductors – Basic ideas of Electrical conductivity in intrinsic and extrinsic semiconductors (without derivations) - temperature dependence of carrier concentration and electrical conductivity in semiconductors (qualitative ideas), Hall effect in Semiconductors -- Application of Hall Effect, Basic Ideas of Compound Semiconductors (II - VI & III - V)

Superconductivity - Basic concepts – transition temperature – Meissener effect – Type I and II superconductors – high temperature superconductors – 123 superconductor – Applications of superconductors.

UNIT V ADVANCED MATERIALS (12 Hrs)

Liquid Crystals – Types – Application as Display Devices
Metallic Glasses – preparation by melt spinning. Twin roller system, properties and applications
Shape Memory alloys (SMA), Shape memory effect, Properties and applications of SMA
Nanomaterials- Nano materials (one, Two & three Dimensional) –Methods of synthesis (PVD, CVD, Laser Ablation, Solgel, Ball-milling Techniques), Properties and applications of nanomaterials. carbon nanotubes– Properties and applications.

Text Books

1. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi 2011.

Reference Books

1. Ali Omar M, Elementary Solid State Physics, Addison Wesley Publishing Co., 2009.
2. William D Callister Jr., Material Science and Engineering, 6th Edition, John Wiley and sons, 2009.
3. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley & sons, Singapore, 2007.
4. V Raghavan, Materials Science and Engineering- A First Course, 5th Edition, Prentice Hall of India, 2008.
5. B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath, and James Murday, Text book of Nanoscience and Nanotechnology, Universities Press, Hyderabad 2012
6. M.N. Avadhanulu, Enginerring Physics- Volume-II, S.Chand & Co, New Delhi, 2009
7. Pillai S.O, Solid State Physics, 6th Edition – New Age International, 2005.

Web References

6. https://swayam.gov.in/nd1_noc20_ph15/preview
7. https://swayam.gov.in/nd1_noc20_ph22/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	2	3	1	1	1	2	3	3	1	2	-
2	3	3	3	1	2	3	1	1	1	2	1	3	3	1	1
3	3	3	3	1	3	3	2	1	1	2	1	3	3	2	2
4	3	3	3	1	3	3	2	1	1	2	2	3	2	1	-
5	3	1	3	1	3	3	2	1	1	2	3	3	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

T109

ENVIRONMENTAL SCIENCE

(Common to all Branches)

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To know about the environment
- To understand about environmental pollution
- To apply the knowledge in understanding various environmental issues and problems
- Communicate clearly and competently matters of environmental concern and understanding to a variety of audiences in appropriate forms
- Evaluate and interpret various forms of evidence, including text, data, and other media about the environment

Course Outcomes

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

CO1 - Understand the various environmental segments, its significance to life, also about various natural resources, effects of over utilization and its protection which can lead to sustainable development. **(K2)**

CO2 - Understand the study of ecology of various systems of nature and also about the diverse species present and its protection. **(K3)**

CO3 - Understand various sources of air pollution, the scientific basis behind it and its effect on nature. **(K2)**

CO4 - Understand the various ways of water pollution, its sources and effects, different water pollution monitoring technique, treatment of waste water and also the effects of solid waste and its management. **(K3)**

CO5 - Understand the concept of spectroscopy and its application to monitor pollution. **(K3)**

UNIT I ENVIRONMENT AND ENERGY RESOURCES

(12 Hrs)

Environmental segments – atmosphere, hydrosphere, lithosphere and biosphere. Atmospheric layers. Pollution definition and classification. Pollutants classification. Forest resources – use and over exploitation, deforestation, forest management. Water resources – use and conflicts over water, dams – benefits and problems. Mineral resources – mineral wealth of India, environmental effects of extracting and using mineral resources. Food resources – world food problems, environmental impact of modern Agriculture – fertilizer and pesticides. Energy resources – growing needs, renewable and non-renewable energy resources and use of alternate energy sources. From unsustainable to sustainable development.

UNIT II ECOSYSTEM AND BIODIVERSITY

(12 Hrs)

Concept of an ecosystem - structure and function of an ecosystem. Producers, consumers, and decomposers. Energy flow in the ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of forest, grassland, desert and aquatic (fresh water, esturine and marine) ecosystems. Biodiversity – definition, genetic species and ecosystem diversity. Value of biodiversity - consumptive use, productive use, social, ethical, aesthetic and option values. Hot spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wildlife, human wildlife conflicts. Endangered and endemic species. Conservation of biodiversity – in-situ and ex-situ conservation of biodiversity.

UNIT III AIR POLLUTION

(12 Hrs)

Definition and classification. Chemical and photochemical reaction in different layers of atmosphere .Causes, sources, effects and control measures of air pollutants - oxides of Nitrogen, oxides of Carbon, oxides of Sulfur, hydrocarbons, chloro-fluoro carbons and particulates. Mechanism and effects of air pollution phenomenon – Global Warming, Ozone Depletion, Acid Rain, Sulfurous Smog and Photochemical Smog

UNIT IV WATER AND LAND POLLUTION

(12 Hrs)

Water pollution – causes and effects of organic water pollutants – pesticides, insecticides, detergents and surfactants. Causes and effects of inorganic water pollutants – heavy metal pollution due to Hg, Pb, Cr & Cu. Water pollution control and monitoring – DO, COD, BOD & TOC. Land Pollution – Solid waste management – causes, effect and control measures of urban and industrial wastes. Thermal and radioactive pollution.

UNIT V POLLUTION CONTROL AND MONITORING

(12 Hrs)

Basic concepts and instrumentation of IR, UV-VIS, atomic absorption spectrometry, Gas Chromatography and Conductometry. Analysis of air pollutants – NO_x, CO_x, SO_x, H_2S, Hydrocarbons and particulates.

Text Books

1. PK. De, "Environmental chemistry" 7th Ed; New age international (P) Ltd, New Delhi, 2010.
2. K. Raghavan Nambiar, "Text Book of Environmental Studies" 2nd Ed, Scitech Publications (India) Pvt Ltd, India, 2010.
3. G. S. Sodhi, Fundamental concepts of environmental chemistry, I Ed, Alpha Science International Ltd, India, 2000.
4. Essentials of Ecology and Environmental Science, S. V. S. Rana , PHI learning, 2009
5. Basics of Environmental Science and Engineering, Sivashanmugam, P., new publishing book house, 2007
6. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi 2011.

Reference Books

1. B.K. Sharma, "Environmental chemistry" 11th Ed, KRISHNA Prakashan Media (P) Ltd, Meerut, 2007.
2. S.S.Dara, and D.D. Mishra "A text book of environmental chemistry and pollution control, 5th Ed, S.Chandand Company Ltd, New Delhi, 2012.
3. Richard T. Wright, Environmental Science: Toward a Sustainable Future, 10thedition, Prentice Hall, 2008
4. Environmental Science, P N Palanisamy , Pearson publications,2012
5. Fundamentals of Environmental Studies, Mahua Basu, Xavier Savarimuthu, SJ, Cambridge University Press· 2017

Web References

1. www.ifpri.org/topic/environment-and-natural-resources
2. https://www.iucn.org/content/biodiversity
3. http://www.world.org/weo/pollution
4. www.water-pollution.org.uk/
5. https://www.tceq.texas.gov/airquality/monops/sites
6. https://guides.library.illinois.edu/c.php?g=347044&p=2349046

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	-	1	3	-	-	-	-	2	2	3	1
2	2	1	1	1	-	1	3	-	-	-	-	2	2	3	1
3	3	1	1	1	-	1	3	-	-	-	-	2	2	3	1
4	3	1	1	1	-	1	3	-	-	-	-	2	2	3	1
5	3	1	1	1	-	1	3	-	-	-	-	2	2	3	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

T110

BASIC CIVIL AND MECHANICAL ENGINEERING

(Common to all Branches)

L	T	P	C	Hrs
4	0	0	4	45

Course Objectives

- To be able to differentiate the type of buildings according to national building code.
- To understand building components and their functions.
- Discuss the different types of roads, bridges and dams.
- To describe different types of combustion systems such as Internal and External Combustion systems
- To discuss various Energy Resources available for power generation.
- To explain the working of various different manufacturing process.

Course Outcomes

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

CO1 - Understand the basic concepts of different types of buildings and building materials. **(K3)**

CO2 - Learn various types of building components and their functions. **(K3)**

CO3 - Describe the importance of the basic infrastructure. **(K3)**

CO4 - Understand the classification of engines, low pressure Steam generators, its mounting and accessories. (K2)

CO5 - Apply the knowledge of thermal systems and equipment's in power plants and analyze the way of harnessing the renewable energies and its utilization. **(K3)**

CO6 - Understand the basic principles of machining, manufacturing and metal joining processes such as Lathe machine, Drilling, Grinding, Welding, green sand moulding foundry process. **(K2)**

PART – A CIVIL ENGINEERING

UNIT I BUILDINGS, BUILDING MATERIALS (10 Hrs)

Buildings – Definition - Classification according to NBC - plinth area, Floor area, carpet area, floor space index - construction materials - stone, brick , cement, cement-mortar, concrete, steel-their properties and uses.

UNIT II BUILDINGS AND THEIR COMPONENTS (10 Hrs)

Buildings: Various Components and their functions. Soils and their classification. Foundation: function and types. Masonry - function and types. Floors: definition and types of floors. Roofs: definition and types.

UNIT III BASIC INFRASTRUCTURE (10 Hrs)

Surveying: classification, general principles, types, Uses, instruments used. Roads- types: components, types and their advantage and disadvantages. Bridges: components and types of bridges. Dams: purpose, types of dams. Water supply- sources and quality requirements, need and principles of rainwater harvesting

PART – B MECHANICAL ENGINEERING

UNIT IV INTERNAL AND EXTERNAL COMBUSTION SYSTEMS (10 Hrs)

IC engines – Classification – Working principles – Diesel and petrol engines: two stroke and four stroke engines – Merits and demerits. Steam generators (Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories – Merits and demerits – Applications.

UNIT V POWER GENERATION SYSTEMS (10 Hrs)

Conventional and Non-Conventional: Hydraulic – Thermal – Nuclear Power plants – Schemes and layouts (Description only) Solar – Wind – Geothermal – Wave – Tidal and Ocean Thermal Energy Conversion systems – Basic power plant schemes and layouts (Description only).

UNIT VI MANUFACTURING PROCESS (10 Hrs)

Machines – Lathe – Drilling – Bending – Grinding – Shearing (Description only) Machine Process – Turning – Planning – Facing – Blanking – Drilling – Punching – Shearing – Bending – Drawing – Filling – Sawing – Grinding. Moulding and Metal Joining – Pattern making – Green and dry sand moulding – Arc and Gas welding – Brazing – Soldering (process description only).

Text Books

1. Natarajan, K V, Basic Civil Engineering, 11th edition, Dhanalakshmi publications Chennai, 2011.
2. Venugopal, K and Prabhu Raja, Basic Mechanical Engineering, Anuradha Publisher, 2012.
3. K.Pravin Kumar, Basic Mechanical Engineering, Pearson Publications, 2009.

4. Shanmugam G, Palanichamy MS, Basic Civil and Mechanical Engineering, 1st Edition, McGraw Hill Education, 2018.
5. R.Vaishnavi, M.Prabhakaran, V.Vijayan, Basic Civil and Mechanical Engineering, S. Chand Publisher, 2013.

Reference Books

1. Purushothama Raj.P., Basic civil engineering, 3rd Edn., Dhanam Publications, Chennai, 2001
2. Rajput, R K, Engineering Materials, S Chand & Co. Ltd., New delhi, 2012.
3. Punmia, B.C., et. al., surveying, Vol-1, Laxmi publishers, New Delhi, 2012.
4. Punmia, B.C., et. al., Building Construction, Laxmi publishers, New Delhi, 2012
5. El. Wakil, M.M., Power Plant Technology, Mc Graw Hill Book Co., 1985.
6. Hajra Choudhry, et. al., Workshop Technology Vol I and II, Media promoters publishers Pvt. Ltd., Bombay, 2004.
7. Lindberg, R.A. Process and Materials of Manufacture, PHI, 1999.
8. H.N.Gupta, R.C. Gupta and Arun Mittal, Manufacturing Process, New Age Publications, 2001.
9. Nagpal, Power Plant Engineering, Khanna Publishers, Delhi, 1998.

Web References

1. https://nptel.ac.in/courses/112107291/
2. https://nptel.ac.in/courses/112/103/112103262/
3. https://ocw.mit.edu/courses/mechanical-engineering/2-61-internal-combustion-engines-spring-2017/ lecture-notes/
4. https://nptel.ac.in/courses/105102088/
5. https://nptel.ac.in/courses/105104101/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	3	1	1	2	1	-	1	2	1	3	-	-	-
2	3	1	3	1	1	2	1	-	1	2	1	3	-	-	-
3	3	1	3	1	1	2	1	-	1	2	1	3	-	-	-
4	3	2	1	-	-	1	2	-	-	-	-	3	1	1	1
5	3	2	2	2	2	2	2	-	-	-	-	3	3	3	1
6	3	2	2	2	2	2	2	-	-	-	-	3	1	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

T111

ENGINEERING MECHANICS

(Common to all Branches)

L	T	P	C	Hrs
3	1	0	4	60

Course Objectives

- To understand the vector and scalar representation of forces and moments, static equilibrium of particles and rigid bodies in two dimensions.
- To comprehend the effect of friction on equilibrium
- To analysis of trusses and friction
- To understand the laws of motion, the kinematics of motion and the interrelationship and to learn to write the dynamic equilibrium equation
- To emphasis the concepts through solved examples

Course Outcomes

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

CO1 - Understand the concepts of Equilibrium of a body, Moment of a force and to convert multiple forces into a single resultant force **(K2)**

CO2 - Apply the principles of internal forces, support reactions on Trusses/beams and friction between two surfaces. (K3)

CO3 - Interpret the knowledge of Centroid and center of gravity for different sections to calculate the moment of inertia for sections. **(K3)**

CO4 - Analyze and compare the principle of conservative forces, conservation of energy and D'Alembert's principle **(K4)**

CO5 - Analyze and compare the kinematics and kinetics of rigid bodies.**(K4)**

UNIT I FUNDAMENTAL OF MECHANICS (12 Hrs)

Basic Concepts Force System and Equilibrium, Definition of force, Moment and Couple, Principle of Transmissibility, Varignon's theorem, Resultant of force system – Concurrent and non-concurrent coplanar forces, Condition of static equilibrium for coplanar force system, stability of equilibrium, applications in solving the problems on static equilibrium of bodies.

UNIT II PRACTICAL APPLICATION OF FORCE SYSTEM (12 Hrs)

Structural member: Definition, degree of freedom, concept of free body diagrams, types of supports and reactions, types of loads, Analysis of trusses-method of joints, method of sections. Friction: Introduction, Static dry friction, simple contact friction problems, ladders, wedges.

UNIT III PROPERTIES OF SURFACES (12 Hrs)

Properties of sections – area, centroids of lines, areas and volumes, moment of inertia first moment of inertia, second moment of inertia and product of moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.

UNIT IV KINEMATICS AND KINETICS OF PARTICLES (12 Hrs)

Equations of motion – Rectilinear motion, curve linear motion, relative motion, D'Alembert's principle, work-Energy equation – conservative forces and principle of conservation of energy, Impulse – momentum, Impact – Direct central impact and oblique central impact

UNIT V KINEMATICS AND KINETICS OF RIGID BODIES (12 Hrs)

Plane motion, absolute motion, Relative motion, translating axes and rotating axes, work and energy, impulse and momentum

Text Books

1. Rajesekaran, S and Sankara Subramanian., G., Engineering Mechanics, Vikas Publishing House Private Ltd., 2002.
2. Dr.I.S.Gujral, "Engineering Mechanicas" second edition, Lakshmi Publication (P), Ltd., 2011.
3. Dr. Sadhu Singh, A Textbook Of Engineering Mechanics, S Chand & company Pvt Ltd., 2013.

Reference Books

1. Palanichamy, M.S. Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill, 2011.
2. Beer, F.P and Johnson Jr. E.R, Vector Mechanics for Engineers, Vol. 1 Statics and Vol.2 Dynamics, McGraw - Hill International Edition, 1997.

3. Bhavikatti,S.S and K.G. Rajashekarappa, Engineering Mechanics, New Age International (p) Ltd, New Delhi, 2010.
4. Arthur P. Boresi and Richard J. Schmidt, "Engineering Mechanics: Statics and Dynamics", Thomson Asia Private Limited, Singapore, 2010.
5. D.P.Sharma "Engineering Mechanics", Dorling Kindersley India Pvt. Ltd, New Delhi, 2010.

Web References

1. http://nptel.iitm.ac.in/video.php?subjectId=112103108
2. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR / Engineering mechanics / Table of Contents.html
3. https://nptel.ac.in/courses/112/106/112106286/
4. https://www.coursera.org/learn/engineering-mechanics-statics
5. https://nptel.ac.in/courses/122/104/122104014/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	3	-	-	-	-	-	-	-	1	2	1	1
2	3	2	2	3	-	-	-	-	-	-	-	1	2	1	1
3	3	2	2	3	-	-	-	-	-	-	-	1	2	1	1
4	3	2	2	3	-	-	-	-	-	-	-	1	1	1	1
5	3	2	2	3	-	-	-	-	-	-	-	1	1	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

T112

COMMUNICATIVE ENGLISH

(Common to all Branches)

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To improve the LSRW skills of I B.Tech students
- To instil confidence and enable the students to communicate with ease
- To equip the students with the necessary skills and develop their language prowess
- To sequence the thought of writing with cohesion and coherence
- To extend knowledge on varied aspects of business correspondence

Course Outcomes

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

CO1 - Procure holistic development of LSRW skills **(K2)**
CO2 - Gain efficacies to compete confidently in the interviews **(K3)**
CO3 - Effectively enhances the oral communication skills **(K3)**
CO4 - Select compile and synthesize information for written mode of communication **(K2)**
CO5 - Familiarize and Excels in different business correspondence in work place **(K3)**

UNIT I BASIC COMMUNICATION THEORY **(12 Hrs)**

Importance of Communication – stages of Communication - modes of communication – barriers to communication – strategies for effective communication – Listening: Importance, types, barriers – Developing effective - listening skills.

UNIT II COMPREHENSION AND ANALYSIS **(12 Hrs)**

Comprehension of technical and non-technical material – Skimming, scanning, inferring-Note making and extension of vocabulary, predicting and responding to context- Intensive Reading and Reviewing

UNIT III WRITING **(12 Hrs)**

Effective sentences, cohesive writing, clarity and conciseness in writing – Introduction to Technical Writing – Better paragraphs, Definitions, Practice in Summary - Writing – Four modes of writing – Use of dictionaries, indices, library references – making - bibliographical entries with regard to sources from books, journals, internet etc.

UNIT IV BUSINESS WRITING / CORRESPONDENCE **(12 Hrs)**

Report writing – Memoranda – Notice – Instruction– Letters – Resumes – Job applications

UNIT V ORAL COMMUNICATION **(12 Hrs)**

Basics of phonetics – Presentation skills – Group Discussions – Dialogue writing –Short Extempore – Debates-Role Plays-Conversation Practice

Text Books

1. Ashraf M.Rizvi., Effective Technical Communication. Tata-McGraw, 2005.

Reference Books

1. Robert J. Dixson., Complete Course in English, Prentice-Hall of India Pvt. Ltd., New Delhi, 2006.
2. Boove, Courtland R et al., Business Communication Today, Pearson Education, New Delhi, 2002.
3. Meenakshi Raman and Sangeeta Sharma., Technical Communication Principles and Practice, OUP, 2007.
4. Robert J. Dixson., Everyday Dialogues in English, Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.
5. Sethi, J and Kamalesh Sadanand., A Practical Course in English Pronunciation, Prentice- Hall of India Pvt. Ltd, New Delhi, 2007

Web References

1. https://books.google.co.in/books/about/Effective_Tech_Communication.html
2. http://www.prenhall.com/bov
3. https://global.oup.com/academic/product/technical-communication
4. https://www.amazon.in/Everyday-Dialogues-English-Dixson-R-J/dp
5. https://www.sapnaonline.com/books/practical-course-english-pronunciation-w-sethi-j-812032594x-9788120325944

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
2	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

P104

PHYSICS LABORATORY

(Common to all Branches)

L	T	P	C	Hrs
0	0	3	2	30

Course Objectives

- To provide a practical understanding of some of the concepts learnt in the theory course on Physics.

Course Outcomes

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

CO1 - Operate optical equipments like Spectrometer, Polarimeter to find the optical properties like dispersive power, Resolving power and specific rotatory power. **(K2)**

CO2 - Capable of handling screw gauge, venire caliper and travelling microscope to calculate the required parameters. **(K4)**

CO3 - Acquired basic knowledge about Thermal conduction and magnetic field due to a current carrying coil. **(K3)**

CO4 - Prepare formal laboratory reports describing the results of experiments and to interpret the data from the experiments. **(K5)**

List of Experiments (Any 10 Experiments)

1. Thermal conductivity – Lee's DISC
2. Thermal conductivity - Radial flow
3. Spectrometer – Prism or Hollow prism
4. Spectrometer – Transmission grating
5. Spectrometer - Ordinary & Extraordinary rays
6. Newton's rings
7. Air – wedge
8. Half shade polarimeter – Determination of specific rotatory power
9. Jolly's experiment – determination of α
10. Magnetism: i – h curve
11. Field along the axis of coil carrying current
12. Vibration magnetometer – calculation of magnetic moment & pole strength
13. Laser experiment: wavelength determination using transmission grating, reflection grating (vernier calipers) & particle size determination
14. Determination of optical absorption coefficient of materials using laser
15. Determination of numerical aperture of an optical fiber
16. Electrical conductivity of semiconductor – two probe / four probe method
17. Hall effect in semiconductor

Reference Books

1. Ajoy Ghatak, Optics, 5th Edition TMH, New Delhi, 2012.
2. K. Thyagarajan and Ajoy Ghatak, Lasers Fundamentals and Applications, 2nd Edition, Springer 2010.
3. R. Murugesan, Modern Physics, S. Chand & Co, New Delhi 2006.
4. K.R.Nambiar, Lasers, New Age International, New Delhi, 2008.
5. Avadhanulu M N, Engineering Physics, S. Chand & Co, 2009.
6. V Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi, 2011.
7. Arthur Beiser, Concepts of Modern Physics, 6th Edition, TMH, New Delhi 2008.

Web References

1. https://swayam.gov.in/nd1_noc20_ph15/preview
2. https://swayam.gov.in/nd1_noc20_ph22/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	1	3	3	2	2	3	3	2	3	2	2	1
2	3	3	1	1	3	3	1	2	3	3	2	3	1	1	-
3	3	3	2	1	3	3	2	2	3	3	2	3	2	1	1
4	3	3	2	1	-	3	2	3	3	3	2	3	1	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

P105

CHEMISTRY LABORATORY

(Common to all Branches)

L	T	P	C	Hrs
0	0	3	2	30

Course Objectives

- To gain a practical knowledge of Engineering Chemistry In relevance to Industrial applications
- To enable the learners to get hands-on experience on the principles discussed in theory sessions and to understand the applications of these concepts in engineering.
- To understand and explain scientifically the various chemistry related problems in the industry
- To develop experimental skills for building technical competence.
- To learn the laboratory skills needed to design, safely conduct and interpret chemical research

Course Outcomes

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

CO1 - To understand about titrimetric analysis which can be used to estimate the amount of metal in a mineral. **(K2)**

CO2 - To understand about titrimetric analysis which can be used to estimate the amount of chemical present in a sample **(K3)**

CO3 - To understand about titrimetric analysis which can be used to estimate the quality of any sample. **(K2)**

CO4 - To perform conductometric titration and its uses to analyze any sample. **(K3)**

CO5 - To perform experiments by using colorimeter From which concentration of a sample can be determined from absorbance value.**(K3)**

List of Experiments (Any 10 Experiments)

1. Determination of dissolved oxygen in water.
2. Determination of total hardness of water by EDTA method.
3. Determination of carbonate and bicarbonate in water.
4. Estimation of chloride content in water.
5. Estimation of magnesium by EDTA.
6. Estimation of acetic acid in vinegar.
7. Estimation of ferrous by permanganometry.
8. Estimation of ferrous and ferric iron in a solution mixture by dichrometry.
9. Estimation of available chlorine in bleaching powder.
10. Estimation of copper in copper sulphate solution.
11. Estimation of calcium by permagnanometry
12. Estimation of iron by colorimetry

Demonstration Experiments (Any two of the following)

1. Determination of COD of water sample.
2. Determination of lead by conductometry
3. Percentage composition of sugar solution by viscometry

Reference Books

1. Vogel's Text book of Macro and Semimicro Qualitative Analysis G. Svehla, Longman Inc., Newyork. 1997
2. Basic Principles of Practical Chemistry, Venkateswaran. V, Veeraswmay. R, Kulandaivelu. A.R., Pearson Education. 1989.
3. Vogel's Text book of Quantitative Analysis, Mendham. J, Denney. R.C, Bames. J.D, and Thomas, M. Pearson Education. 1989.
4. Practical Chemistry, D. N Bajpai, S. Giri and O P Pandey, Chand Publishing 2013
5. Allied Practical Chemsitry, A R Kulandaivelu , V Venkateswaran & R Veeraswamy, Chand Publications, 2001

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1. https://edu.rsc.org/resources/titration-screen-experiment/2077.article
2. https://edu.rsc.org/resources/aspirin-screen-experiment/1644.article
3. https://www.stem.org.uk/resources/collection/3959/practical-chemistry
4. https://www.scienceinschool.org/2010/issue14/practical

5. http://www.chemlabs.bris.ac.uk/outreach/resources/Teachers_Websites.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	2	2	-	-	1	3	1	-	-	-	-	-
2	-	-	-	2	2	-	-	1	3	1	-	-	-	-	-
3	-	-	-	2	2	-	-	1	3	1	-	-	1	2	-
4	-	-	-	2	2	-	-	1	3	1	-	-	-	1	-
5	-	-	-	2	2	-	-	1	3	1	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

P106

WORKSHOP PRACTICE

(Common to all Branches)

L	T	P	C	Hrs
0	0	3	2	30

Course Objectives

- To convey the basics of mechanical tools used in engineering
- To establish hands on experience on the working tools
- To develop basic joints and fittings using the hand tools
- To establish the importance of joints and fitting in engineering applications
- To explain the role of basic workshop in engineering and underlying physical mechanism used in mechanical machines.

Course Outcomes

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

CO1 - Understand the functioning and usage of basic hand tools of fitting, welding and carpentry. **(K2)**

CO2 - Apply the knowledge of fitting tools and machineries to perform the exercise on fitting joints like symmetric asymmetric and angular fitting. **(K3)**

CO3 - Apply the knowledge of gas and Arc welding principles to perform to join the metal with joints like Lap and V- Butt joints. **(K3)**

CO4 - Apply the knowledge of metal joining process using sheet metals and to perform to make tray and frustum. **(K3)**

CO5 - Apply the knowledge of carpentry tools and equipment's to perform the joints like mortise and half lap joint. **(K3)**

Sl. No.	Trade	List of Exercises
1	Fitting	Study of tools and Machineries. Exercises on symmetric joints and joints with acute angle.
2	Welding	Study of arc and gas welding equipment and tools – Edge preparation – Exercise on lap joint and V Butt joints – Demonstration of gas welding
3	Sheet metal work	Study of tools and Machineries – Exercise on simple products like Office tray and waste collection tray.
4	Carpentry	Study of tools and Machineries – Exercises on Lap joints and Mortise joints

LIST OF EXERCISES

I - FITTING

1. Study of tools and Machineries
2. Symmetric fitting
3. Acute angle fitting

II - WELDING

1. Study of arc and gas welding equipment and tools
2. Simple lap welding (Arc)
3. M Single V butt welding (Arc)

III - SHEET METAL WORK

1. Study of tools and machineries
2. Frustum
3. Waste collection tray

IV - CARPENTRY

1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint.

Reference Books

1. HS Bawa, Workshop Practices, Tata Mc Graw Hill Publishing Co Ltd, 2015
2. S.K. Hajra Choudhury, A. K. Hajra Choudhury, "Elements of Workshop Technology", Vol I:Manufacturing Processes, 15th Edition Reprinted, Media Promoters & Publishers Pvt Ltd.,2013
3. D.Sathish, Engineering Workshop Practices Laboratory Manual, Notion press publisher, 2019
4. R.K. Rajput, Workshop Practice, Published by Laxmi Publications Pvt. Ltd. 2011
5. RS Khurmi and JK Gupta, Basics of Workshop Practice, S Chand Publisher, 2011

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2. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=3804
3. https://www.tpctraining.com/collections/machine-shop-practices-training
4. https://www.vlab.co.in/broad-area-mechanical-engineering
5. https://nptel.ac.in/courses/112/107/112107219/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	1	1	-	-	-	-	-	-	-	1	-	-
2	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-
3	2	1	-	1	-	-	-	-	-	-	-	-	1	-	1
4	2	1	-	-	1	-	-	-	-	-	-	-	1	-	-
5	2	1	1	1	-	-	-	-	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

P107

NCC / NSS

(Common to all Branches)

L	T	P	C	Hrs
0	0	0	-	-

NCC/NSS training is compulsory for all the Undergraduate students

1. The above activities will include Practical/field activities/Extension lectures.
2. The above activities shall be carried out outside class hours.
3. In the above activities, the student participation shall be for a minimum period of 30 hours.
4. The above activities will be monitored by the respective faculty in-charge.
5. Pass /Fail will be determined on the basis of participation, attendance, performance and behavior. If a candidate Fails, he/she has to repeat the course in the subsequent years.

Pass in this course is mandatory for the award of degree

SEMESTER III

U19CST31

NUMERICAL METHODS

(Common to CSE, IT & BME)

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

- To know the solution of algebraic and transcendental equations.
- To learn the techniques of solving simultaneous equations.
- To introduce the numerical techniques of differentiation and integration.
- To solve ordinary differential equations by using numerical methods.
- To know the solution of partial differential equations by using numerical methods.

Course Outcomes

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

CO 1 – Use Numerical techniques to solve algebraic and transcendental equations. **(K2)**
CO 2 – Find the solution of simultaneous equations. **(K2)**
CO 3 – Apply the knowledge of differentiation and integration by using numerical methods. **(K3)**
CO 4 – Solve the ordinary differential equations by using various methods. **(K3)**
CO 5 – Solve the partial differential equations by numerical methods. **(K3)**

UNIT I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS AND EIGEN VALUE PROBLEMS (12Hrs)

Bisection method – Method of false position – Newton Raphson method – Eigen value and Eigen vector by power method.

UNIT II LINEAR SIMULTANEOUS EQUATIONS (12 Hrs)

Solution of linear simultaneous equations and matrix inversion – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.

UNIT III INTERPOLATION (12 Hrs)

Interpolation: Finite Differences – Relation between operators – Interpolation by Newton's forward and backward difference formula for equal intervals – Newton's divided difference method and Lagrange's method for unequal intervals – Differentiation based on finite differences – Integrations by Trapezoidal and Simpson's rules.

UNIT IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (12 Hrs)

Single step methods – Taylor series method – Picard's method – Euler and Improved Euler methods – Runge Kutta method of fourth order only.

UNIT V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (12 Hrs)

Solution of Laplace and Poisson equations – Leibmann's iterative method – Diffusion equation: Bender-Schmitt method and Crank-Nicholson implicit difference method – Wave equation: Explicit difference method

Text Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., 7th Edition, 2019.

Reference Books

1. C. Xavier, "C Language And Numerical Methods", New Age International, 2007.
2. P. Siva Ramakrishna Das, "Numerical Analysis", Kindle Edition, 2016.
3. Timo Heister, Leo G. Rebholz, Fei Xue, "Numerical Analysis an Introduction", Publisher De Gruyter, 2019.
4. K. Sankara Rao, "Numerical Methods for Scientists and Engineers", PHI Learning Pvt.Ltd, New Delhi, 3rd Edition, 2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

Web References

1. http://nptel.ac.in/courses/111107063
2. http://nptel.ac.in/courses/122102009
3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	-	-	-	-	-	1	3	2	1
2	2	1	-	-	-	1	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
5	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CST32 DATA STRUCTURES

(Common to CSE,ECE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To impart the basic concepts of data structures and its terminologies.
- To understand concepts about stack and queue operations.
- To understand basic concepts about linked list and its various operations.
- To understand concepts about Tree and its applications.
- To understand basic concepts about Sorting, Hashing and Graph.

Course Outcomes

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

CO1 - Compute time and space complexity for given problems **(K3)**
CO2 - Demonstrate stack, queue and its operation. **(K3)**
CO3 - Illustrate the various operations of linked list. **(K3)**
CO4 - Use the concepts of tree for various applications. **(K3)**
CO5 - Outline the various sorting, hashing and graph techniques. **(K3)**

UNIT I BASIC TERMINOLOGIES OF DATA STRUCTURES (9 Hrs)

Introduction: Basic Terminologies – Elementary Data Organizations. Data Structure Operations: Insertion – Deletion – Traversal. Analysis of an Algorithm. Asymptotic Notations. Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques – Complexity analysis.

UNIT II STACK AND QUEUE OPERATIONS (9 Hrs)

Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.

UNIT III LINKED LIST OPERATIONS (9 Hrs)

Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.

UNIT IV TREES (9 Hrs)

Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree. Introduction to B-Tree and B+ Tree.

UNIT V SORTING, HASHING AND GRAPHS (9 Hrs)

Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table – Hash Function and its characteristics. Graph: Basic Terminologies and Representations – Graph traversal algorithms.

Text Books

1. Ellis Horowitz, Sartaj Sahni,"Fundamentals of Data Structures", Computer Science Press, Second Edition, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. Balagurusamy, "Data Structures", Tata McGraw-Hill Education, 2019.
2. D.Samanta, "Classic Data Structures, Prentice-Hall of India, Second Edition, 2012.
3. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c", Prentice-Hall of India, Second Edition, 2007.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition, 2006.
5. Mark Allen Weiss, "Algorithms, Data Structures and Problem Solving with C++", Addison-Wesley Publishing Company, Illustrated Edition, 1995.

Web References

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial/
3. https://www.studytonight.com/data-structures/
4. https://www.tutorialspoint.com/data_structures_algorithms/
5. https://www.w3schools.in/data-structures-tutorial/intro/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CST33	DIGITAL DESIGN AND MICROPROCESSORS (Common to CSE and IT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To gain knowledge on Boolean algebra and design combinational circuit.
- To understand the behavior of sequential circuits.
- To understand and learn the architecture and assembly language program of 8085.
- To understand and learn the architecture and assembly language program of 8086.
- To explore the interfacing the peripherals and other chips to 8086.

Course Outcomes

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

CO1 - Review the knowledge of Number systems and design of combinational circuits. **(K2)**
CO2 - Design and understand the various sequential circuits. **(K2)**
CO3 - Explain the basic architecture of 8085 microprocessors. **(K3)**
CO4 - Gain the knowledge of the architecture and instruction sets of 8086. **(K3)**
CO5 - Acquire the interfacing the various peripherals to various 8086. **(K3)**

UNIT I REVIEW OF NUMBER SYSTEMS AND COMBINATIONAL CIRCUITS (9 Hrs)

Review of Number systems – Conversion of Number systems — Binary codes – Boolean Algebra – Boolean functions – canonical forms - Simplifications of Boolean function: Theorems and laws, K'Map and Quine McCluskey method - Introduction to combinational circuits – Design procedures of Combinational circuits – Adders - Subtractors – Binary parallel Adder – Decoder – Encoder – Multiplexer — Demultiplexer.

UNIT II SEQUENTIAL CIRCUITS (9 Hrs)

Introduction to Sequential Circuits – Latches - Types of Latches : SR Latch and D Latch – Flip-Flop- Types of Flip-Flops : RS, JK,D,T Flip-Flops – Excitation table of Flip-Flops – Counters : Asynchronous Counters – Synchronous counters – Mod counters - Shift registers – Types of Shift registers : SISO,SIPO,PISO,PIPO.

UNIT III INTEL 8085 MICROPROCESSORS (9 Hrs)

Introduction – Need for Microprocessor – Evolution – 8085 Architecture – Pin diagram - Timing Diagram – Addressing Modes – Instruction Formats – Instruction Set- Interrupts.

UNIT IV INTEL 8086 MICROPROCESSORS (9 Hrs)

Introduction to 8086 Microprocessor - 8086 Architecture - Pin diagram –I/O & Memory Interfacing – Addressing Modes – Instruction Format – Instruction Set – Assembler Directives – Assembly Language Programming.

UNIT V PERIPERALS AND INTERFACING TO 8086 (9 Hrs)

Programmable Peripheral Interface (8255) – Serial Communication interface (8251) – Programmable Timer Controller (8254) — Programmable Interrupt Controller (8259) – DMA controller (8237).

Text Books

1. M. Morris Mano and Michael Ciletti, "Digital Design", Sixth Edition, Pearson India Education Services, Pvt. Ltd., 2018.
2. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085", Penram International Publications, Sixth Edition, 2013.
3. Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2014.

Reference Books

1. Tocci R J and Widmer N S, "Digital Systems - Principles and Applications", Prentice Hall of India, New Delhi,11th Edition, 2010.
2. Charles H Roth, "Fundamentals of Logic Design", Thomas Publication Company, 7th Edition, 2011.
3. John.F.Wakerly,"Digital Design Principles and Practices", Pearson Education, 4th Edition, 2006.
4. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2015.
5. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH 2012.

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1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
2. https://nptel.ac.in/courses/117/105/117105080/
3. https://nptel.ac.in/courses/108/105/108105102/
4. https://swayam.gov.in/nd1_noc20_ee42/microprocessors-and-microcontrollers/
5. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/microprocessor/labs/explist.php

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	2	-	-	-	-	-	-	-	2	1	2
2	3	3	2	1	2	-	-	-	-	-	-	-	1	3	1
3	3	3	-	-	2	-	-	-	-	-	-	-	1	2	1
4	2	3	-	3	3	-	-	-	-	-	-	-	3	3	-
5	3	3	1	-	1	-	-	-	-	-	-	-	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CST34 AUTOMATA AND COMPILER DESIGN

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

- To introduce the Finite Automata, NFA and DFA.
- To gain insight into the Context Free Language and Pushdown Automata.
- To understand in depth about Parsing and Turing machine.
- To study about the Lexical Analysis and Syntax Analysis.
- To acquaint the Intermediate Code Generation, Code Optimization and Code Generation.

Course Outcomes

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

CO1 - Understand the concept of Finite Automata, NFA and DFA. **(K2)**
CO2 - Understand about Context Free Language and Pushdown Automata. **(K2)**
CO3 - Construct a Turing Machine.**(K3)**
CO4 - Explain the concept of Lexical Analysis and Syntax Analysis. **(K3)**
CO5 - Describe the Intermediate code generation, Code Optimization and Code Generation. **(K4)**

UNIT I FINITE AUTOMATA AND REGULAR EXPRESSIONS (12 Hrs)

Introduction: Finite Automata – Deterministic Finite Automata – Non-Deterministic Finite Automata – Conversion from NFA to DFA – NFA with ε moves. Regular Expression: Conversion from Regular Expression to DFA (Direct / Indirect method) – Two way finite automata – Moore and Mealy Machine – Applications of Finite Automata.

UNIT II CONTEXT-FREE GRAMMAR AND LANGUAGES AND PUSHDOWN AUTOMATA (12 Hrs)

Context – Free Grammar and Languages: Definitions and More Examples – Regular Languages and Regular Grammars – Derivation Trees and Ambiguity – Simplified Forms and Normal Forms – Chomsky Normal Form – Greibach Normal Form. Pushdown Automata: Definitions and Examples – A PDA from a Given CFG – A CFG from a Given PDA. Pumping Lemma.

UNIT III TURING MACHINES (12 Hrs)

Turing Machines: Turing Machines as Language Acceptors – Turing Machines for Accepting Regular Languages – Turing Machine for Addition and Subtraction.

UNIT IV LEXICAL ANALYSIS AND SYNTAX ANALYSIS (12 Hrs)

Compilers: The Phases of compiler – Lexical analysis – The role of the lexical analyser – Input buffering – Specification of tokens – Recognition of tokens – A language for specifying lexical analyzers – Design of a lexical analyzer. Parser: Top Down Parser – Predictive Parser, Bottom up Parser – SLR Parser.

UNIT V INTERMEDIATE CODE GENERATION, CODE OPTIMIZATION AND CODE GENERATION(12 Hrs)

Intermediate Code Generation: Declarations – Assignment statements – Boolean expressions – Procedure calls. Code Optimization: Principle sources of optimization – Loop Optimization. Code Generation: Issues in the design of code generator – Simple code generator – Basic blocks and flow graphs – The DAG representation of Basic Block – Generating code form DAGs – Peephole optimization.

Text Books

1. Hopcroft, 'Introduction to Automata Theory, Languages, and Computation", Pearson, 3^{rd} Edition, 2008.
2. Alfred Aho, V. Ravi Sethi, and D. Jeffery Ullman, "Compilers Principles, Techniques and Tools", Addison-Wesley, 2^{nd} Edition, 2007.
3. John C. Martin, "Introduction to Languages and the Theory of Computations", McGraw Hill, 3^{rd} Edition, 2007.

Reference Books

1. Kamala Krithivasan, Rama R, "Introduction to Formal languages Automata Theory and Computation", Pearson, 2019.
2. Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett, 6th Edition, 2016.
3. Anil Malviya, Malabika Datta, "Theory of Computation & Applications - Automata Theory Formal Languages", BPB publications, 2015.
4. Charles N. Fischer and Richard J. Leblanc, "Crafting a Compiler with C", Benjamin Cummings, 2009.
5. Mishra K.L.P, "Theory of Computer Science: Automata, Languages and Computation", Prentice Hall India Learning, 1st Edition, 2006.

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1. https://www.cse.iitb.ac.in/~akg/courses/2019-cs310/index.html
2. https://www.cse.iitm.ac.in/~krishna/cs3300/
3. https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/
4. https://www.javatpoint.com/automata-tutorial
5. https://www.tutorialspoint.com/automata_theory/index.htm

COs/POs/PSOs Mapping

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1	2	3	2	3	3	1	1	-	2	-	-	-	3	2	2
2	3	3	3	2	3	1	2	-	2	1	-	2	3	2	2
3	2	3	2	3	2	2	-	-	3	-	-	-	3	2	2
4	3	3	2	3	3	1	-	-	2	-	-	-	3	2	2
5	2	3	3	2	2	2	1	-	2	-	-	-	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CST35	OPERATING SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To grasp a fundamental understanding of operating systems and processes.
- To learn the concepts of CPU scheduling and deadlock.
- To understand synchronization and memory management concepts in OS.
- To understand the concepts of file systems and secondary storage structure.
- To learn the features of commercial operating systems.

Course Outcomes

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

CO1 - Define the concepts of operating systems operations, processes and threads. **(K2)**
CO2 - Apply the concepts of CPU scheduling and deadlock techniques. **(K3)**
CO3 - Simulate the principles of memory management. **(K3)**
CO4 - Identify appropriate file system and disk organizations for a variety of computing scenario. **(K3)**
CO5 - Examine the features of various open source operating systems. **(K4)**

UNIT I INTRODUCTION AND PROCESS MANAGEMENT (9 Hrs)

Operating system structure – Operating system operations – Process management – Memory management – Storage management – Protection and Security – System structures: Operating system services – System calls – Types of system calls -- System programs. Process scheduling – Operations on processes – Inter-process communication. Case study: Linux process management

UNIT II CPU SCHEDULING AND DEADLOCK (9 Hrs)

Overview of threads – Multithreading models – Threading issues – Basic concepts of process scheduling – Scheduling criteria – Scheduling algorithms – Multiple processor scheduling, Dead Lock: Characterization – Prevention Detection – Avoidance and Recovery. Case Study: Linux Scheduling.

UNIT III CONCURRENT PROCESSES AND MEMORY MANAGEMENT (9 Hrs)

Process synchronization: The Critical Section Problem – Peterson's solution – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors. Memory Management: Swapping – Contiguous memory allocation – Paging – Structure of the Page Table – Segmentation, Demand Paging – Page Replacement – Allocation of Frames – Thrashing. Case Study: Linux Memory Management.

UNIT IV FILE SYSTEMS AND SECONDARY STORAGE STRUCTURE (9 Hrs)

File Concept – Access Methods – Directory structure – File system mounting – File sharing – Protection – 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.

UNIT V CASE STUDY (9 Hrs)

LINUX System: Basic Concepts – System administration – Requirements for Linux System Administrator – Setting up a LINUX multifunction server – Domain Name System – Setting up local network services. Virtualization: Basic concepts – Setting Up Xen – VMware on LINUX Host and adding guest OS. Comparison of LINUX and MICROSOFT Windows operating system concepts.

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons Ninth Edition, 2017.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, 3rd Edition, 2015.
3. Gary Nutt, "Operating Systems - A Modern Perspective", Pearson Education, Second Edition, 2013.

Reference Books

1. William Stallings, "Operating System", Prentice Hall of India, 6th Edition, 2015.
2. Thomas Anderson and Michael Dahlin, "Operating Systems principles and practice", Wiley, 2nd Edition, 2014.
3. Harvey M. Deitel, "Operating Systems", Pearson Education, Third Edition, 2013.
4. Silberschatz, Galvin, "Operating System Concepts", Wiley, Student Edition, 2006.
5. William Stallings, "Operating System: Internals and design Principles", Old Edition (7), Pearson Education India.

Web References

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2. http://www.tcyonline.com/tests/operating-system-concepts
3. http://www.galvin.info/history-of-operating-system-concepts-textbook
4. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html
5. https://www.cse.iitk.ac.in/pages/CS330.html

COs/POs/PSOs Mapping

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1	-	1	-	1	1	1	1	-	-	-	-	-	2	1	2
2	-	2	-	2	2	2	2	-	-	-	-	2	2	1	2
3	2	2	2	2	2	-	-	-	-	-	2	-	2	1	2
4	3	3	-	3	3	3	3	3	-	-	3	3	2	1	2
5	3	3	3	3	3	3	3	3	-	3	-	3	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CST36 DATA COMMUNICATIONS AND COMPUTER NETWORKS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To gain and explore the basic concepts of Data Communications.
- To understand the signals and transmission media involved in the physical layer.
- To learn the basic concepts of data link layer services and network layer communication protocols .
- To synthesize various load characteristics and network traffic conditions, decide the transport protocols to be used.
- To analyze and compare the different protocols available in the application layer and Network Security.

Course Outcomes

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

CO1 - Analyze the network components and network standards. **(K1)**

CO2 - Determine the Physical layer functionalities, Transmission media and Switching. **(K3)**

CO3 - Analyze the Error correction and detection techniques and determine the proper usage of IP address, subnet mask and default gateway in a routed network. **(K3)**

CO4 - Describe, analyze and compare different protocols in transport layer. **(K4)**

CO5 - Analyze the functional working of different protocols of application layer and Network Security. **(K4)**

UNIT I DATA COMMUNICATIONS (9 Hrs)

Overview of Data Communications – Networks and its types – Network topologies – Transmission technologies: Digital signaling – Analog Signaling – Networks Models: Protocol Layering – OSI reference model – TCP/IP Protocol suite.

UNIT II PHYSICAL LAYER AND MEDIA (9 Hrs)

Data and Signals: Analog and digital – Periodic Analog Signals – Digital Signals – Digital Transmission: Digital-to-Digital Conversion – Analog to Digital Conversion – Transmission Media: Guided and unguided media. Switching: Introduction – Circuit Switching – Packet switching.

UNIT III DATA LINK LAYER AND NETWORK LAYER (9 Hrs)

Data link layer design issues – Error Detection and Correction – Sliding window protocols – Network Layer Design Issues – Routing Algorithms: The Optimality Principle – Shortest path algorithm – Distance vector routing – Link state routing, Hierarchical routing – Broadcast, Multicast routing – The Network Layer in the Internet:IPV4 – IPV6.

UNIT IV TRANSPORT LAYER (9 Hrs)

The Transport Service – Elements of Transport Protocols – Transport layer Congestion Control – Transport Layer Protocols: User Datagram Protocol (UDP) – Transmission Control Protocol (TCP):TCP Connection Establishment – TCP Connection Release.

UNIT V APPLICATION LAYER AND NETWORK SECURITY (9 Hrs)

Application Layer Protocols – HTTP – FTP – Telnet – Email Protocols: SMTP – POP3 – IMAP and MIME – DNS – Network Security: Cryptography – Public Key Algorithms – Firewalls.

Text Books

1. Behrouz A. Forouzan, "Data Communications and Networking", TMH, Fifth Edition, 2013.
2. Larry L. Peterson and Bruce S. Davie, "Computer Networks- A system approach", 5th edition, Elsevier, 2012.
3. Andrew Tanenbaum and David J. Wetherall "Computer Networks", Prentice Hall, 5th Edition , 2011

Reference Books

1. Andrew S.Tanenbaum, "Computer Networks", Pearson Publication, 4th Edition, 2018.
2. Pallapamanvi. V., "Data Communications and Computer Networks", PHI, 4th edition, 2014.
3. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach: International Edition", Pearson Education, Sixth edition, 2013.
4. Stallings, W., "Data and Computer Communications", 10th Ed., Prentice Hall Int. Ed., 2013.
5. Dayanand Ambawade, Deven Shah, "Advanced Computer Networks", Dreamtech Press, 1st edition, 2011.

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4. https://lecturenotes.in
5. https://www.cse.iitk.ac.in/users/dheeraj/cs425/

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1	-	2	2	2	2	2	2	-	-	2	-	-	3	2	-
2	2	2	2	2	2	2	-	-	-	-	-	-	3	-	-
3	3	3	3	3	-	3	3			3	3	3	3	2	2
4	1	1	1	1	-	-	1	-	-	-	-	-	1	-	1
5	3	3	3	3	3	3	3	-	-	-	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19CSP31	**NUMERICAL METHODS LABORATORY** (Common to CSE & IT)	**0**	**0**	**2**	**1**	**30**

Course Objectives

- To learn the techniques of non – linear equation using c program.
- To understand the numerical solution of a matrix by power - method using c program.
- To know the techniques of solving simultaneous equations using c program.
- To introduce the numerical techniques of integration using c programming.
- To study about the numerical solution of parabolic equation.

Course Outcomes

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

CO1 – Find out the root of the Algebraic and Transcendental equations using C Programming. **(K3)**
CO2 – Know the concept of matrix by power method using C programming. **(K3)**
CO3 – Solve the system of simultaneous equations using C programming. **(K3)**
CO4 – Implement numerical techniques of integration using C programming. **(K3)**
CO5 – Find the numerical solution of parabolic equation using C programming **(K3)**

List of exercises

1. Roots of non – linear equation using bisection method.
2. Roots of non – linear equation using Newton's method.
3. Find the largest Eigen value of a matrix by power - method.
4. Solve the system of linear equations using Gauss - Elimination method.
5. Solve the system of linear equations using Gauss - Jordan method.
6. Solve the system of linear equations using Gauss - Seidal iteration method.
7. Find area by using trapezoidal rule.
8. Find area by using Simpson's 1/3 rule.
9. Find area by using Simpson's 3/8 rule.
10. Find the numerical solution of heat equation.

Reference Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., (Seventh Edition) 2019.
4. K. Sankara Rao, "Numerical Methods for Scientists and Engineers", PHI Learning Pvt.Ltd, New Delhi, 3rd Edition,2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

Web References

1. http://nptel.ac.in/courses/111107063
2. http://nptel.ac.in/courses/122102009
3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
2	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
5	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

U19CSP32

DATA STRUCTURES LABORATORY

(Common to ECE, IT, ICE,
MECH, CIVIL, BME, MECHTRONICS)

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To understand the basic concepts of Data Structures.
- To learn about the concepts of Searching Techniques.
- To explore about the concepts of Sorting Techniques.
- To know about the linear Data Structures.
- To study about non-linear Data Structures.

Course Outcomes

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

CO1 - Analyze the algorithm's / program's efficiency in terms of time and space complexity.**(K3)**
CO2 - Solve the given problem by identifying the appropriate Data Structure.**(K3)**
CO3 - Solve the problems of searching and sorting techniques. **(K3)**
CO4 - Solve problems in linear Data Structures.**(K4)**
CO5 - Solve problems in non-linear Data Structures. **(K4)**

List of Exercises

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a)Delete an element from list c) Search for a key element in list d) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
    a) Insert an element into a binary search tree.
    b) Delete an element from a binary search tree.
    c) Search for a key element in a binary search tree.
8. Write a C program that use recursive functions to traverse the given binary tree in
    a) Preorder b) Inorder and c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.
2. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st Edition, 2017.
4. Reema Thareja, "Data structures using C", Oxford University, 2nd Edition, 2014.
5. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st Edition, 2019.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. https://www.w3schools.in/data-structures-tutorial/intro/
3. https://nptel.ac.in/courses/106103069/
4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. https://nptel.ac.in/courses/106103069/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

		L	T	P	C	Hrs
U19CSP33	**DIGITAL DESIGN AND MICROPROCESSORS LABORATORY**	0	0	2	1	30

(Common to CSE and IT)

Course Objectives

- To design and analyze a combinational circuits.
- To design and analyze a sequential circuits.
- To write assembly language programs using 8085 trainer kit.
- To be familiar with MASM-8086
- To apply the knowledge into interfacing and various applications 8085/8086.

Course Outcomes

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

CO1 - Understand the fundamental operations of Combinational Circuits. **(K1)**
CO2 - Understand the fundamental operations of Sequential Circuits. **(K1)**
CO3 - Develop simple programs and design interfacing circuits with 8085. **(K3)**
CO4 - Learn assembly language program using MASM. **(K3)**
CO5 - Gain the knowledge of interfacing and various applications of 8085/8086. **(K3)**

List of Exercises

1. Implementation of logic circuits using gates
    1. Full adder/full Subtractor
    2. Implementation of logic functions using universal gates only
    3. Implementation of Boolean functions using MUX
    4. Design of decoder, Demultiplexer.
    5. Design an Asynchronous and Synchronous counter.
2. Assembly language programming on 8085.
    1. Addition
    2. Subtraction
    3. Multiplication
    4. Division
    5. Code conversion
3. Assembly Language programming on 8086.
    1. Addition
    2. Subtraction
    3. Multiplication
    4. Division
    5. Searching element
4. Interfacing program for 8085/8086
    1. Traffic Light Control.
    2. Moving display
    3. Stepper Motor control.

Reference Books

1. Tocci R J and Widmer N S, "Digital Systems - Principles and Applications", Prentice Hall of India, New Delhi,11th Edition, 2010.
2. Charles H Roth, "Fundamentals of Logic Design", Thomas Publication Company, 7th Edition, 2011.
3. John.F.Wakerly,"Digital Design Principles and Practices", Pearson Education,4th Edition, 2006.
4. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2015
5. Doughlas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH 2012.

Web References

1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
2. https://nptel.ac.in/courses/117/105/117105080/
3. https://nptel.ac.in/courses/108/105/108105102/
4. https://swayam.gov.in/nd1_noc20_ee42/microprocessors-and-microcontrollers/
5. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/microprocessor/labs/explist.php

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	2	-	-	-	2	-	-	-	2	1	2
2	3	3	2	1	2	-	-	-	2	-	-	-	1	3	1
3	3	3	-	-	2	-	-	-	2	-	-	-	1	2	1
4	2	3	-	3	3	-	-	-	3	-	-	-	3	3	-
5	3	3	1	-	1	-	-	-	3	-	-	-	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSP34 LINUX INTERNALS LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To learn basic UNIX / LINUX commands
- To develop programs in Linux environment using system calls.
- To implement the CPU scheduling algorithms.
- To implement Deadlock handling algorithm.
- To develop solutions for synchronization problems using semaphores

Course Outcomes

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

CO1 - Understand the basic commands for Linux. **(K2)**
CO2 - Develop simple shell programs. **(K2)**
CO3 - Implement different Scheduling Algorithms **(K5)**
CO4 - Apply the basic concepts of Deadlock Handling procedures. **(K4)**
CO5 - Simulate Critical Section problem using Semaphore **(K4)**

List of Exercises

1. Study of basic UNIX/Linux commands
2. Shell Programming - I
    - (a) To Write a Shell program to count the number of words in a file.
    - (b) To Write a Shell program to calculate the factorial of a given number.
    - (c) To write a Shell program to generate Fibonacci series.
    - (d) Write a Shell Program to wish the user based on the login time.
3. Shell Programming - II
    - (a) Loops
    - (b) Patterns
    - (c) Expansions
    - (d) Substitutions
4. Programs using the following system calls of UNIX/Linux operating system: fork, exec, getpid, exit, wait, close, stat, open dir, read dir.
5. To write a program to simulate cat command.
6. To write a program to simulate head and tail commands.
7. Simulate UNIX commands like ls, grep.
8. Process Scheduling- FCFS, SJF, Priority and Round robin.
9. Implementation of Banker's algorithm.
10. Write a C program to simulate producer and consumer problem using semaphores

Reference Books

1. William Stallings, "Operating System", Pearson Education, Sixth edition, 2015.
2. Andrew S. Tanenbaum, Modern Operating Systems,3rd edition Prentice Hall of India Pvt. Ltd, 2015.
3. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt, Third Edition, 2013
4. William Stallings, "Operating System: Internals and design Principles", Old Edition(7), Pearson Education, 2013.
5. Silberschatz, Galvin, "Operating System Concepts", Wiley, Student Edition, 2006.

Web References

1. https://www.geeksforgeeks.org
2. http://avanthioslab.blogspot.com/2016/08/file-organization-techniques.html
3. https://www.programming9.com/programs/c-programs/285-page-replacement-programs-in-c

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	-	1	1	1	1	-	-	-	-	-	-	-	2
2	-	2	-	2	2	2	2	-	-	-	-	2	-	-	2
3	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2
4	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2
5	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSC3X CERTIFICATION COURSES

L	T	P	C	Hrs
0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

		L	T	P	C	Hrs
U19CSS31	**GENERAL PROFICIENCY–I** (Common to all branches)	0	0	2	0	30

Course Objectives

- To enrich strong vocabulary and decoding skills through comprehension analysis
- To advance communication and leadership skills pragmatically
- To pronounce English sounds in isolation and in connected speech
- To expand effective written communication skills to meet organizational goals
- To extend knowledge on verbal aptitude and prepare for interviews

Course Outcomes

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

CO1 - Interpret meaning and apply reading strategies in technical and non-technical context **(K2)**
CO2 - Develop interpersonal communication skills professionally **(K3)**
CO3 - Infer the distinct speech sounds and overcome native language influence **(K2)**
CO4 - Demonstrate various forms of formal writing **(K2)**
CO5 - Apply the techniques of verbal aptitude in competitive exams **(K3)**

UNIT I COMPREHENSION ANALYSIS (6Hrs)

Listening: Listening Comprehension (IELTS based) – **Speaking**: Break the iceberg - **Reading:** Reading technical passage (IELTS based) - **Writing:** Writing Task: 1 (IELTS: Graph/ Process /Chart Description) **Vocabulary:** Synonyms (IELTS)

UNIT II PERSONALITY DEVELOPMENT (6Hrs)

Listening: Interview Videos- **Speaking:** Extempore& Presentation (Soft Skills) - **Reading:** British & American Vocabulary, Read and review (Books, Magazines) - **Writing**: SWOT Analysis **Vocabulary:** Idioms (IELTS)

UNIT III INFERENTIAL LEARNING (6Hrs)

Listening: Listening Speech sounds to overcome Mother Tongue Influence, Anecdotes– **Speaking**: Interpersonal Interaction & Situational attribution–**Reading**: Distinguish between facts & opinions - **Writing:** Writing Conversation to different context **Vocabulary:** Phrasal Verbs (IELTS)

UNIT IV INTERPRETATION AND FUNCTIONAL WRITING (6Hrs)

Listening: Group Discussion videos - **Speaking:** Group Discussion Practice - **Reading:** Interpretation of data - Graph, table, chart, diagram (IELTS based) -**Writing**: Writing Task: 2 (IELTS) **Vocabulary:** Collocations (IELTS)

UNIT V APTITUDE (6Hrs)

Language Enhancement: Articles, Preposition, Tenses

Verbal Ability Enhancement: Blood Relation, Completing Statements- Cloze test, Spotting Errors – Sentence Improvement, One Word Substitution, Word Analogy, Word Groups(**GATE)**

Reference Books

1. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, New Delhi, 2012.
2. Mn, Taylor, and Grant Taylor. "English Conversation Practice". Tata McGraw-Hill Education, 2004.
3. Bailey, Stephen. "Academic writing: A practical guide for students". Psychology Press, 2003.
4. Aggarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
5. Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

Web References

1. https://www.ielts-exam.net/grammar/
2. https://ieltsfocus.com/2017/08/02/collocations-ielts/
3. https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
4. https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
5. https://www.examsbook.com/word-analogy-test-questions-with-answers

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
2	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19CSS32	**COMPUTER ASSEMBLY AND TROUBLESHOOTING**	0	0	2	-	30

Course Objectives

- Demonstrate Computer assembly and parts identification.
- Inculcate how to install Operating system.
- Understand how to setup PC in a network
- Understand the troubleshooting of printers
- Troubleshooting of PC related problems

Course Outcomes

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

CO1 - Acquire knowledge to assemble PCs.**(K3)**
CO2 - Understand to install operating system in a PC. **(K3)**
CO3 - Design a simple LAN network. **(K3)**
CO4 - Apply troubleshooting methods in printers. **(K3)**
CO5 - Apply troubleshooting approaches in PC. **(K3)**

List of Exercises

1. Assembling of a Personal Computer:
   a) Identifying parts of mother board, power connections and locating other connectors.
   b) Interconnection of disk drive units, keyboard, mouse and monitor.
2. Partitioning the hard disk using FDISK/ Partition Magic/ Disk Manager.
3. Installation of Windows.
4. Install and Configure Dual OS Installation.
5. Networking PCs: setting up Wired/ Wireless LANs and troubleshooting.
6. Identify, install and manage network connections Configuring IP address and Domain name system.
7. Networking of devices using Bluetooth interface.
8. Installation Antivirus and configure the antivirus.
9. Installation of printer and scanner software.
10. Trouble shooting and Managing Systems.
11. Serial Communication: To establish serial communication (RS232C) between a pair of PCs.

Reference Books

1. Peter Norton, "Introduction to Computers", Mc Graw Hill Publishers, 7th Edition, 2017.
2. David Anfinson and Ken Quamme, "IT Essentials PC Hardware and Software Companion Guide", Pearson Education, Third Edition, 2010
3. Vikas Gupta, "Comdex Information Technology course tool kit", WILEY Dreamtech, 2009
4. Scott Muller, "Upgrading and Repairing PC's", 18th Edition, Pearson Education. 2007.
5. Kate J. Chase, " PC Hardware and A+Handbook", PHI (Microsoft), 2004.

Web References

1. https://en.wikibooks.org/wiki/How_To_Assemble_A_Desktop_PC/Assembly
2. https://www.instructables.com/id/How-To-Assemble-A-Basic-Desktop-PC/
3. https://www.coursera.org/lecture/system-administration-it-infrastructure-services/troubleshooting-and-managing-issues-ks1P1

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
2	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
3	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
4	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
5	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSS32

APTITUDE - I

L	T	P	C	Hrs
0	0	2	0	30

Course Contents

- Number System - Basics, Properties & Type of Numbers - Divisibility Rules.
- LCM & HCF - Unit Digit Concept [Cyclicity Method].
- Decimals, Simplification. Ratio & Proportion - Compounded & Duplicate Ratio - Inverse Ratio - Shortcut to Find Ratio - Continuous Proportion - Mean & Divisibility Proportion.
- Ages - Both Data is in Ratio or Time Format - One Data in Ratio or Time Format & Other Data in Sum, Difference or Product.
- Logical [Puzzles] Method.
- Average - Basics & Finding Average in Complex - Replacement & Alteration Method - Average Speed Finding Problems.
- Allegation & Mixtures.
- Ratio of Mixture - Finding the Kilogram through Ratio.
- Mean Value Method.
- Ratio Mixture [Fraction Method] - Iteration Method.

		L	T	P	C	Hrs
U19CSS32	**ELECTRONIC DEVICES AND CIRCUITS**	0	0	2	0	30

Course Objectives

- To provide the basic operation and applications of electronic devices.
- To provide working knowledge of the working of analogue electronic circuits.
- To provide the basic knowledge of design and implementation of amplifier.
- To provide the basic knowledge of design and implementation of diodes and transistors.
- To provide experience in design and implementation of analogue circuits using discrete electronic components.

Course Outcomes

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

CO1 - Student should be able to understand the working of analog circuits like rectifiers, clippers, clampers etc.**(K3)**

CO2 - Student should be able to design and implement circuits like RC coupled amplifier, tuned amplifier, Schmitt trigger etc.**(K3)**

CO3 - Student should be able to design and demonstrate the functioning of regulators, oscillators and power amplifiers.**(K3)**

CO4 - Students should be able to analyze and interpret the characteristics of diodes and transistors.**(K3)**

CO5 - Students should be able to function effectively as an individual and in a team to accomplish the given task.**(K3)**

List of Exercises

1. VI characteristics of rectifier and Zener diodes
2. RC integrating and differentiating circuits (Transient analysis with different inputs and frequency response)
3. Clipping and clamping circuits (Transients and transfer characteristics)
4. Full-wave rectifiers - with and without filter - ripple factor and regulation
5. Simple Zener voltage regulator (load and line regulation)
6. Characteristics of BJT in CE configuration and evaluation of parameters
7. Characteristics of MOSFET in CS configuration and evaluation of parameters
8. RC Coupled CE amplifier - frequency response characteristics.
9. MOSFET amplifier (CS) - frequency response characteristics.
10. Cascade amplifier – gain and frequency response
11. Cascade amplifier – frequency response
12. Feedback amplifiers (current series, voltage series) - gain and frequency response
13. Low frequency oscillators – RC phase shift, Wien bridge
14. High frequency oscillators – Colpitt"s and Hartley
15. Power amplifiers (transformer less), Class B and Class AB.
16. Transistor series voltage regulator (load and line regulation)
17. Tuned amplifier – frequency response
18. Bootstrap sweep circuit
19. Multi vibrators – astable, monostable, bistable
20. Schmitt trigger

Reference Books

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education Eleventh Edition, 2015.
2. M. Morris Mano, "Digital Design", Pearson Education, 6th Edition, 2017.
3. David A Bell, "Fundamentals of Electronic Devices and Circuits", Fifth edition Oxford Press, 2009
4. Thomas L. Floyd, "Digital Fundamentals", Tenth Edition, Pearson Education, NewDelhi, 2009.
5. Varsha Agrawal Anil K. Maini,"Electronic Devices and Circuits",Wiley,1st edition,2019

Web References

1. http://www.electronics-tutorials.ws
2. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
3. https://nptel.ac.in/courses/117106114/
4. https://nptel.ac.in/courses/117106086/
5. https://www.vlab.co.in/broad-area-electronics-and-communications

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	1	-	-
2	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
3	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-
4	3	2	1	1	3	-	-	-	-	-	-	-	1	-	-
5	3	2	1	1	-	-	-	-	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19CSM31	**PHYSICAL EDUCATION**	**0**	**0**	**2**	**-**	**30**

Physical Education is compulsory for all the Undergraduate students and Pass in this course is mandatory for the award of degree. Physical Education activities will include games and sports/extension lectures. The student participation shall be for minimum period of 30 hours. Physical Education activities will be monitored by the Director of Physical Education. Pass/Fail will be determined on the basis of participation, attendance, performance and conduct. If a candidate fails, he/she has to repeat the course in the subsequent years.

SEMESTER IV

		L	T	P	C	Hrs
U19CST41	**DISCRETE MATHEMATICS AND GRAPH THEORY** (Common to CSE & IT)	**2**	**2**	**0**	**3**	**60**

Course Objectives

- To learn the concept of symbolic logic and truth tables.
- To apply the rules of Inference and predicate calculus.
- Analyze the asymptotic performance of Lattices.
- To understand the fundamental concepts of Graph theory.
- Synthesize efficient algorithms in Graph theory and trees.

Course Outcomes

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

CO1 – Construct mathematical arguments using logical connectives and truth tables. **(K3)**
CO2 – Apply propositional and predicate logic and quantifiers. **(K3)**
CO3 – Solve the problems using counting techniques in Lattices. **(K3)**
CO4 – Familiarize the different types of Graphs. **(K3)**
CO5 – Understand various types of trees and methods for algorithms. **(K2)**

UNIT I MATHEMATICAL LOGIC AND STATEMENT CALCULUS

(12Hrs)

Introduction – Connectives – Statement formulae – Truth table – Tautologies – Equivalence of Statement formulae – NAND and NOR Connectives – Implications – Principal conjunctive and disjunctive normal forms.

UNIT II PREDICATE CALCULUS

(12Hrs)

Inference calculus – Derivation process – Conditional proof – Indirect method of proof – Automatic theorem proving – Predicate calculus.

UNIT III LATTICES

(12 Hrs)

Boolean algebra – Lattices – Sub lattices – Complemented and Distributive lattices. Partially Ordered Relations – Lattices as Posets – Hasse Diagram – Properties of Lattices.

UNIT IV GRAPH THEORY

(12 Hrs)

Graphs – Applications of graphs – Degree – Pendant and isolated vertices – Isomorphism – Sub graphs – Walks – Paths and Circuits – Connected graphs – Euler graphs – Hamilton paths and circuits – Complete graph.

UNIT V TREES

(12 Hrs)

Trees – Properties of Trees – Pendant vertices in a Tree – Kruskal algorithm.

Text Books

1. P.Tremblay and R.Manohar, "Discrete Mathematical structures with applications to computer science", 13th reprint, Tata McGraw - Hill publishers, 2002.
2. Narsinghdeo, "Graph Theory with Applications to Engineering and Computer Science", Dover Publications New York , 1st Edition, 2016.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw - Hill Publishing Company, Pvt. Ltd., New Delhi, 5th Edition, 2003.

Reference Books

1. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw - Hill Education Pvt. Ltd., 3rd Edition, 2008.
2. F. Harary, "Graph theory", Narosa publishing house, New Delhi, 1988..
3. Douglas B. West, "Introduction to Graph theory", Pearson Education, 2nd Edition, 2002.
4. Oscar Levin, "Discrete Mathematics An Open Introduction", 3rd Edition, 4th Printing: 2019 ISBN: 978-1792901690
5. Edgar C Coodare and Michael M Parmenter, "Discrete Mathematics with Graph Theory", Pearson Education; 3rd Edition, 2015.

Web References

1. https://www.researchgate.net/publication/1922282_Discrete_Mathematics_for_Computer_Science_Some_Notes
2. https://nptel.ac.in/courses/111/107/111107058/
3. https://nptel.ac.in/courses/106/106/106106183/
4. https://www.pdfdrive.com/discrete-mathematics-for-computer-science-e17017833.html
5. https://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
2	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	1	1
5	2	1	-	-	-	-	-	-	-	-	-	1	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19CST42	**PROGRAMMING IN JAVA**	3	0	0	3	45

(Common to CSE, IT, ICE,CIVIL, BME)

Course Objectives

- To gain and explore the knowledge of java programming
- To know the principles of inheritances, packages, interfaces
- To get familiarized to generic programming, multithreading concepts.
- To gain and explore the advanced concepts in Java.
- To explore database connectivity

Course Outcomes

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

CO1 - Write a maintainable java program for a given algorithm and implement the same. **(K2)**
CO2 - Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**
CO3 - Create java applications using exception handling, thread and generic programming. **(K3)**
CO4 - Build java distributed applications using Collections and IO streams. **(K3)**
CO5 - Exemplify simple graphical user interfaces using GUI components and database programs. **(K3)**

UNIT I INTRODUCTION TO JAVA PROGRAMMING (9 Hrs)

The History and Evolution of Java – Byte code – Java buzzwords – Data types – Variables – Arrays – operators – Control statements – Type conversion and casting. Concepts of classes and objects: Basic Concepts of OOPs – constructors – static keyword – Final with data – Access control – This key word – Garbage collection – Nested classes and inner classes – String class

UNIT II INHERITANCE, PACKAGES AND INTERFACES (9 Hrs)

Inheritance: Basic concepts – Forms of inheritance – Super key word – method overriding – Abstract classes – Dynamic method dispatch – The Object class. Packages: Defining – Creating and Accessing – importing packages. Interfaces: Defining – Implementing – Applying – Variables and extending interfaces

UNIT III EXCEPTION HANDLING, MULTITHREADING (9 Hrs)

Concepts of Exception handling – Types of exceptions – Creating own exception – Concepts of Multithreading – creating multiple threads – Synchronization – Inter thread communication. Enumeration: Autoboxing – Generics.

UNIT IV COLLECTIONS, I/O STREAMS (9 Hrs)

Collections: List – Vector – Stack – Queue – Dequeue – Set – Sorted Set. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files.

UNIT V EVENT DRIVEN PROGRAMMING AND JDBC (9 Hrs)

Events – Delegation event model – Event handling – Adapter classes. AWT: Concepts of components – Font class – Color class and Graphics. Introduction to Swing: Layout management - Swing Components. Java Database Connectivity. Develop real time applications.

Text Books

1. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, 11th Edition, 2018.
2. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
3. Herbert Schildt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.

Reference Books

1. H.M.Dietel and P.J.Dietel, "Java How to Program", 11th Edition, Pearson Education/PHI, 2017.
2. Nageshvar rao, "Core Java and Integrated Approach", 1st Edition, Dreamtech, 2016.
3. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", Prentice Hall, 9th Edition, 2013.
4. P.J. Dietel and H.M Dietel, "Java for Programmers", Pearson Education, 9th Edition, 2011.
5. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Pearson Education, 8th Edition, 2008.

Web References

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog
5. https://www.geeksforgeeks.org

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2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CST43 DATABASE MANAGEMENT SYSTEMS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To learn about Database Structure and Data Models.
- To study SQL Commands for storing and retrieving data into the database.
- To study the Relational database system design
- To understand the concept of Transactions
- To understand the concept of Concurrency Control and Recovery System

Course Outcomes

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

CO1 - Design conceptual data model using Entity Relationship Diagram. **(K2)**
CO2 - Design conceptual and logical database models for an application. **(K3)**
CO3 - Normalize relational database design of an application. **(K3)**
CO4 - Explain the need for Indexing, Hashing and Transactions in database. **(K2)**
CO5 - Understand the strategies for providing security, privacy, and recovery of data. **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Database System Application – Purpose of Database Systems – View of Data – Database Languages – Relational Database – Database Design – System Structure – Database Architecture. Database Design and E-R Model: Overview of the Design Process – The E-R Model – Constraints – E-R Diagrams- E-R Design Issues – Extended E-R features – Reduction to Relational Schemas – Other aspects of Database Design.

UNIT II RELATIONAL MODEL (9 Hrs)

Structure of Relational Database – Fundamental Relational Algebra Operations – Extended Relational Algebra Operations – Modification of the Database. Structured Query Language: Introduction – Basic Structure of SQL Queries – Set Operations – Additional Basic Operations – Aggregate Functions – Null Values – Nested Sub queries – Views – Join Expression.

UNIT III RELATIONAL DATABASE DESIGN (9 Hrs)

Features of Good Relational Designs – 1NF – 2NF – 3NF and 4NF with Examples. Atomic Domains and first Normal form – Decomposition using Functional Dependencies – Functional Dependency Theory – Algorithm for Decomposition – Decomposition using Multivalued Dependencies.

UNIT IV INDEXING - HASHING AND TRANSACTION MANAGEMENT (9 Hrs)

Basic Concepts – Ordered Indices – B+ Tree Index Files – B-Tree Files – Multiples – Key Access – Static Hashing – Dynamic Hashing – Comparison of Ordered Indexing and Hashing – Bitmap Indices. Transaction Management: Transaction concept – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation and Atomicity – Serializability – Recoverability – Transaction Isolation Levels – Implementation of Isolation Levels.

UNIT V QUERY PROCESSING AND CONCURRENCY CONTROL (9 Hrs)

Query Processing: Measures of Query Cost – Selection Operation – Sorting – Join Operation – Other Operations – Evaluation of Expressions. Query optimization: Overview – Transformation of Relational Expressions – Estimating Statistics of Expression Results – Choice of Evaluation Plan Concurrency Control: Lock Based Protocols – Timestamp Based Protocols – Validation Based Protocols. Recovery System: Failure Classification – Remote Backup Systems.

Text Books

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", McGraw-Hill, 7th Edition, 2019.
2. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, 2018.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems The Complete Book" Prentice Hall, 2nd Edition, 2014.

Reference Books

1. Raghu Ramakrishna, Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition, 2014.
2. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
3. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database System", Pearson Education, 8th Edition, 2006.
4. Paul Beynon-Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003.
5. Mukesh Chandra Negi, "Fundamentals of Database Management Systems", BPB Publications, 2019.

Web References

1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. http://dev.mysql.com/doc/
3. http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf
4. https://nptel.ac.in/courses/106/106/106106095/
5. https://www.tutorialspoint.com/dbms/index.htm

COs/POs/PSOs Mapping

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2	2	3	3	3	2	2	1	1	2	1	-	-	3	3	3
3	3	3	3	3	2	2	2	-	2	1	2	2	3	2	3
4	3	2	3	3	1	2	2	-	2	1	2	3	3	3	3
5	3	3	3	3	2	2	2	-	2	1	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CST44 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

- To understand the performance analysis of Algorithms.
- To compare the searching and traversal techniques.
- To understand the problems based on divide and conquer and Greedy method.
- To understand the problems based on dynamic programming and backtracking methods.
- To understand the problems based on branch and bound and NP-Hard.

Course Outcomes

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

CO1 - Analyze and improve the efficiency of algorithms and estimate the performance of algorithm. **(K2)**

CO2 - Apply different designing methods for development of algorithms to realistic problems. **(K3)**

CO3 - Determine the Divide and Conquer, Greedy paradigms and explain when an algorithmic design situation calls for it. **(K3)**

CO4 - Determine the Dynamic programming, Backtracking paradigms and explain when an algorithmic design situation calls for it. **(K3)**

CO5 - Interpret the Branch and Bound and NP-Hard paradigms and explain when an algorithmic design situation calls for it. **(K2)**

UNIT I INTRODUCTION TO ALGORITHM AND NOTATIONS (12 Hrs)

Introduction – Algorithm – Pseudo code for expressing algorithms – Performance Analysis – Time complexity – Space complexity – Asymptotic Notation – Big oh notation – Omega notation – Theta notation and Little oh notation – Probabilistic analysis – Amortized analysis.

UNIT II DIVIDE AND CONQUER, GREEDY METHOD (12 Hrs)

Divide and Conquer method: Solving recurrence relations – Applications – Binary search – Merge sort – Quick sort. Greedy method: General method – applications – Job sequencing with deadlines – Knapsack problem – Minimum cost spanning trees – Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING (12 Hrs)

Dynamic Programming: Applications – Multistage graphs – Optimal binary search trees – 0/1 knapsack problem, All pairs shortest path problem – Traveling sales person problem – Reliability design – Chained Matrix Multiplication – Graph Applications: AND/OR graphs – Connected components – Identification of articulation points – Bi-connected components.

UNIT IV BACKTRACKING METHOD (12 Hrs)

Backtracking: General method. Applications – N – queen problem – Sum of subsets problem – Graph coloring – Hamiltonian cycle – 0/1 Knapsack Problem.

UNIT V BRANCH AND BOUND, NP-HARD PROBLEMS (12 Hrs)

General method – Applications – Traveling sales person problem – 0/1 knapsack problem – LC Branch and Bound solution – FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts – Non deterministic algorithms – NP-Hard and NP-Complete classes.

Text Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.
2. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
3. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", PHI/Pearson Education, 3rdEdition, 2009.

Reference Books

1. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.
2. Donald E Knuth, "The Art of Computer Programming, Volume I & II", Addison Wessely, Third Edition, 2011.
3. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education, 3rd Edition, 2010.
4. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India, 2006.
5. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

Web References

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
2. https://www.javatpoint.com/daa-tutorial
3. https://www.guru99.com/design-analysis-algorithms-tutorial.html
4. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
5. https://swayam.gov.in/nd1_noc20_cs71/preview

COs/POs/PSOs Mapping

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2	3	2	3	3	2	2	1	-	-	-	-	-	3	3	3
3	3	3	3	3	2	2	2	-	2	-	-	-	3	2	3
4	3	2	3	3	3	2	2	-	-	-	3	-	3	3	3
5	3	3	3	3	2	2	2	-	-	-	3	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19CSP41	**PROGRAMMING IN JAVA LABORATORY**	0	0	2	1	30

(Common to CSE, IT, ICE,CIVIL, BME)

Course Objectives

- To acquire programming skill in core java.
- To learn how to design java program and applications.
- To acquire object oriented skills in java.
- To develop the skill of designing applications.
- To explore database connectivity.

Course Outcomes

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

CO1 - Apply and practice logical formulations to solve simple problems leading to specific applications. **(K3)**
CO2 - Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**
CO3 - Create java applications using exception handling multithread. **(K3)**
CO4 - Build java distributed applications using Collections and IO streams.**(K3)**
CO5 - Develop simple database programs. **(K3)**

List of Exercises

1. Develop simple programs using java technologies and testing tools.
2. Develop a java program that implements class and object.
3. Write a java program to demonstrate inheritance.
4. Develop a simple real life application program to illustrate the use of Multi Threads.
5. Implement simple applications using Collections.
6. Develop a simple application and use JDBC to connect to a back-end database.
7. Create a student application with Add, Edit, Delete, Show functions using JDBC.
8. Create a Bill Application to store sales details using JDBC.
9. Create java applications using Exception Handling for error handling.
10. Develop a java program that implements the Packages.

Reference Books

1. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
2. Paul Deitel Harvey Deitel, "JAVA How to program (Early Objects)",19th Edition, 2011
3. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Vol 2, Advanced Features, Pearson Education, Seventh Edition, 2010.
4. Herbert Schil dt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.
5. E. Balaguruswamy, "Programming with Java", TMH, 2nd Edition, 2005.

Web References

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog
5. https://www.geeksforgeeks.org

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3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

U19CSP42 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To learn and understand DDL & DML
- To learn and understand DCL.
- To implement Basic SQL commands.
- To execute PL/SQL programs.
- To develop GUI applications in any platform.

Course Outcomes

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

CO1 - Implement DDL and DML commands.**(K3)**
CO2 - Implement DCL commands. **(K3)**
CO3 - Analyze PL/SQL programs. **(K3)**
CO4 - Understand PL/SQL programs. **(K3)**
CO5 - Develop GUI applications in their known platform. **(K3)**

List of Exercises

1. Create Table using Data Definition Language (DDL).
2. Modify Table using Data Manipulation Language (DML).
3. Store and Retrieve data through Data Control Language (DCL).
4. Implement Constraints and Built-in functions in various tables.
5. Perform Joins and Group-by functions.
6. Implement Simple Programs in SQL.
7. Create SQL programs using functions.
8. Create SQL programs using procedures.
9. Create SQL programs using triggers.
10. Developing GUI applications.
    - Student Information System.
    - Inventory Management.
    - Payroll Processing.

Reference Books

1. RamezElmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, Pearson Education, 7th Edition, 2016.
2. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, McGraw Hill, 3rd Edition, 2014.
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts", McGraw-Hill Indian Edition, 7th Edition, 2013.
4. Kuhn,"RMAN Recipes for Oracle Database", Apress,2nd Edition, 2013.
5. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System, Pearson Education, 8th Edition, 2006.

Web References

1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. http://dev.mysql.com/doc/
3. http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf

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4	3	2	3	3	2	2	1	-	2	1	-	-	3	3	3
5	3	3	3	3	2	2	2	-	2	1	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSP43 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course objectives

- To introduce the basic concepts of various algorithm design techniques.
- Solving various real time problems using Greedy methods.
- To implement real time problems using Analyze dynamic programming
- Experimental with different algorithm techniques like Backtracking and Branch and Bound
- To analyze algorithm for time and space complexity.

Course Outcomes

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

CO1 - Demonstrate various algorithm design techniques used to solve real time problems**(K2)**

CO2 - Analyze the algorithm efficiency in terms of time and space complexity.**(K3)**

CO3 - Solve the real time problems using Divide and Conquer, and Greedy paradigms and derives the time complexity. **(K3)**

CO4 - Determine the Dynamic programming, Backtracking paradigms and explain when an algorithmic design situation calls for it. **(K3)**

CO5 - Interpret the Branch and Bound and NP-Hard paradigms and explain when an algorithmic design situation calls for it. **(K2)**

List of Exercises

1. Implementation of binary search using Divide-and-Conquer technique.
2. Implementation of Finding Maximum and Minimum using Divide-and-Conquer technique.
3. Implementation of Knapsack using Greedy technique.
4. Implementation of Minimum Spanning Tree using Prim's and Kruskal's Algorithm using Greedy technique.
5. Implementation of Single-Source Shortest Paths algorithms using Greedy technique.
6. Implementation of Multi-Stage Graphs using Dynamic Programming technique.
7. Implementation of All Pairs Shortest Paths using Dynamic Programming technique.
8. Implementation of Traveling Salesman algorithms using Dynamic Programming technique.
9. Implementation of 8 Queens with the design of Backtracking.
10. Implementation of sum of subsets with the design of Backtracking.
11. Implementation of 0/1 Knapsack problems with Branch-and-Bound technique.
12. Implementation of Traveling Salesman problems with Branch-and-Bound technique.

Text Books

1. Faruqi A,"Design and Analysis of Algorithms", CBS Publishers, 2016.
2. S Sridhar," Design and Analysis of Algorithms First Edition", Oxford University Press,1st Edition, 2015.
3. Dave,"Desgin and Analysis of Algorithms", Pearson Education India, 2nd Edition, 2013.

References Books

1. Levitin Anany," Introduction to the Design and Analysis of Algorithms", Pearson Education India,1st Edition, 2019.
2. Aho Alfred V.,"Design & Analysis of Computer Algorithms", Pearson Education India,2nd Edition,2018
3. Basu S. K.," Design Methods and Analysis of Algorithms", PHI Learning,3rd Edition, 2018.
4. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", 2nd Edition, Galgotia Publications, 2010.
5. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms, 3rd Edition, PHI/Pearson Education, 2009.

Web References

1. https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial
2. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
3. https://swayam.gov.in/nd1_noc20_cs71/preview
4. https://swayam.gov.in/nd1_noc20_cs93/preview.

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4	3	2	3	3	3	2	2	-	-	-	3	-	3	3	3
5	3	3	3	3	2	2	2	-	-	-	3	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSC4X CERTIFICATION COURSES

L	T	P	C	Hrs
0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

		L	T	P	C	Hrs
U19CSS41	**GENERAL PROFICIENCY–II** (Common to all branches)	0	0	2	0	30

Course Objectives

- To examine various standardized test in English language
- To recognize the key features of various technical writing
- To integrate LSRW skills to endorse multifarious skill set in practical situation
- To understand the factors that influence the usage of grammar
- To understand the basic concepts of logical reasoning skills

Course Outcomes

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

- Infer ideas to attend international standardized test by broadening receptive and productive skills **(K2)**
- Interpret the types of writing in different state of affairs **(K2)**
- Develop language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation **(K3)**
- Identify the rules of grammar in academic discourse settings **(K3)**
- Extend the skills to compete in various competitive exams like GATE, GRE, CAT, UPSC, etc. **(K2)**

UNIT I CAREER SKILLS (6Hrs)

Listening: Listening at specific contexts **Speaking:** Mock interview (Personal & Telephonic)-**Reading**: Read and Review -Newspaper, Advertisement, Company Handbooks, and Guidelines (IELTS based) **Writing:** Essay Writing (TOEFL) **Vocabulary:** Words at specified context (IELTS).

UNIT II CORPORATE SKILLS (6Hrs)

Listening: Listening and replicating **Speaking**: Team Presentation (Work Place Etiquettes) **Reading:** Short texts (signs, emoticons, messages) **Writing:** E-mail writing- Hard skills -Resume' Writing, Job Application Letter, Formal Letter **Vocabulary:** Glossary (IELTS).

UNIT III FUNCTIONAL SKILLS (6Hrs)

Listening: Listening TED Talks – **Speaking:** Brainstorming &Individual Presentation, Persuasive Communication — **Reading:** Text Completion (GRE Based) **Writing:** Expansion of Compound Words **Vocabulary:** Expansion of vocabulary (IELTS).

UNIT IV TRANSFERABLE SKILLS (6Hrs)

Listening: Listening Documentaries and making notes –**Speaking:** Conversation practice at formal & informal context **Reading:** Read and transform- report, memo, notice and advertisement, **Writing:** Euphemism, Redundancy, and Intensifiers **Vocabulary:** Refinement of vocabulary (IELTS).

UNIT V APTITUDE (6 Hrs)

Transformational Grammar: Phrases & Clauses, Concord, Conditional Clauses, Voice, Modals
Verbal Ability Enhancement: Letter Series, Coding &Decoding, Sentence Completion (GATE), Critical Reasoning & Verbal Deduction (GATE), Syllogism.

Reference Books

1. Lougheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.
2. Tulgan, Bruce. "Bridging the soft skills gap: How to teach the missing basics to today's young talent". John Wiley & Sons, 2015.
3. Sherfield, Robert M. "Cornerstone: Developing Soft Skills". Pearson Education India, 2009.
4. Cullen, Pauline, Amanda French, and Vanessa Jakeman. "The official Cambridge guide to IELTS for academic & general training".Cambridge, 2014.
5. Ramesh, Gopalaswamy. "The ace of soft skills: attitude, communication and etiquette for success". Pearson Education India, 2010.

Web References

1. https://www.englishclub.com/grammar/nouns-compound.htm
2. https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/l3p1
3. https://www.grammarwiz.com/phrases-and-clauses-quiz.html
4. https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/
5. http://www.englishvocabularyexercises.com/general-vocabulary/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
2	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
4	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSS42	EXPLORING PHOTOSHOP	L	T	P	C	Hours
		0	0	2	0	30

Course Objectives

- To understand about the basic Photoshop files and tools
- Explore Photoshop Help, and use it to find out more about the tools in the Toolbox.
- Create a layered Photoshop document from a image
- Create images that demonstrate advanced selection and layering techniques.
- Create a theme based image using Photoshop tools.

Course Outcomes

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

CO1 - Identify elements of the Photoshop user interface and demonstrate knowledge of their functions.
CO2 - Demonstrate knowledge of layers and images
CO3 - Apply painted masks, selection-based masks, gradient masks, and blend modes to create sophisticated image effects.
CO4 - Create adjustment layers for editable, non-destructive changes to image coloration and exposure.
CO5 - Apply special effects to Zooming using masks, paths, and layer styles.

List of Exercises

1. Study of Photoshop files and tools
2. Create a Visiting Card by using appropriate tools in Photoshop.
3. Design a photo frame using custom shapes in Photoshop
4. Convert a color photo to black and white photo
5. Explain the steps for Designing a Passport Size Photo on a Max Size Paper
6. Removing White Background On Logo And Turn Into Transparent Image
7. Zooming Effect in picture
8. Panorama
9. Mass Image Editing Using Photoshop Actions
10. Create a Banner

Reference Books

1. Lisa Fridsma, Brie Gyncild,"Adobe After Effects Classroom in a book", Adobe Press, 2020.
2. Andrew Faulkner, Conrad Chavez," Adobe Photoshop CC", Adobe Press, 2016.
3. Conrad Chavez,"Color Management for Photographers and Designers," Peach Pit, 2014.
4. Elaine Weinmann, Peter Lourekas, "Photoshop CC: Visual QuickStart Guide ",Peachpit press,2014.
5. Derek Lea ,"Creative Photoshop:Digital Illustration and art techniques", Focal Press,2012.

Web References

1. https://nptel.ac.in/content/storage2/courses/112101002/downloads/Lec_41-42.pdf
2. https://nptel.ac.in/courses/106/106/106106177/
3. http://www.nptelvideos.com/adobe/adobe_photoshop_tutorials.php
4. https://www.adobe.com/products/captivateprime/content-catalog/creative-cloud/photoshop-cc.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	1	-	-	-	2	-	-	2	1	-	[illegible]
2	-	-	-	-	3	-	-	-	-	3	-	2	1	-	-
3	-	-	-	-	3	-	-	-	-	3	-	2	1	-	-
4	2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
5	3	3	1	-	-	2	3	-	3	2	3	3	3	3	-

B. Tech. Computer Science and Engineering

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSS42 **APTITUDE - II**

L	T	P	C	Hrs
0	0	2	0	30

Course Contents

- Number System – II [Advanced Level].
- Factors [Sum, Product, odd, Even].
- Remainder Theorem - No of Zeros at End -Highest Power - Finding the Last two Digits.
- Time & Work, Chain Rule - Working Together.
- Combination Method - Before, After & Alternative Method.
- Men & Days - Men, Days & Work - Efficiency & Wages.
- Equation Method.
- Profit & Loss - Basics & Short Cuts - Passing Through Successive Hands.
- Purchase & Selling - Dishonest Shopkeeper.
- Successive Discount into Single Equivalent Discount - Dealing with two or more Parts.
- Percentage - Conversion & Shortcuts - Population, Depreciation Methods.
- Percentage Savings & Expenditure - Reduction in Consumption - Percentage Relationship.
- Time, Speed & Distance, Trains, Boats - Relationship between T/S/D.
- Train in same Direction - Opposite Direction.
- Boats along with Streams - Against the Streams.

U19CSS42 OFFICE AUTOMATION

MS OFFICE

Introduction to MS Office - MS Word and Open Office – Writer: MS Word - Working with Documents -Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help, **Formatting Documents** - Setting Font styles, Font selection- style, size, colour etc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering. **Setting Page style** - Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes – Shortcut Keys; Inserting manual page break, Column break and line break, Creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page.

TABLES AND DRAWING TOOLS

Creating Tables- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, **Drawing** - Inserting ClipArts, Pictures/Files etc., **Tools** – Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature. Printing Documents – Shortcut keys.

MS POWERPOINT

MS Power point: Introduction to presentation – Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts. **Creating a presentation** - Setting Presentation style, Adding text to the Presentation. Formatting a Presentation - Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw. **Adding Effects to the Presentation**- Setting Animation & transition effect. **Printing Handouts,** Generating Standalone Presentation viewer.

MS EXCEL

MS Excel: Spread Sheet & its Applications, Opening Spreadsheet, Menus - main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types. Working with Spreadsheets- opening, Saving files, setting Margins, Converting files to different formats (importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys. **Entering & Deleting Data**- Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc, Inserting Functions, Manual breaks, **Setting Formula** - finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae.

MS ACCESS

MS Access: Introduction, Planning a Database, Starting Access, Access Screen, Creating a New Database, Creating Tables, Working with Forms, Creating queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing & Print Preview – Importing data from other databases viz. MS Excel etc.

References Books

1. Working in Microsoft Office – Richard Mansfield – Tata McGraw Hill Education.
2. Professional Office Procedure by Susan H Cooperman, Printice Hall
3. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
4. Technology And Procedures for Administrative Professionals by Patsy Fulton-Calkins, Thomson Learning
5. Microsoft Office 2010 For Dummies By Wallace Wang
6. 2007 Microsoft Office System Plain & Simple by Jerry Joyce Microsoft Press
7. Office XP: The Complete Reference- Stephen L. Selson – Tata McGraw Hill Education.

Web References

1. http://office.microsoft.com/en-us/training/CR010047968.aspx
2. https://gsuite.google.com/learning-center
3. http://spoken-tutorial.org

U19CSM41 INDIAN CONSTITUTION

L	T	P	C	Hrs
2	0	0	0	30

Course Objectives

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties

Course Outcomes

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

CO1 - Understand historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration

CO2 - Understand knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy

UNIT I INDIAN CONSTITUTION

Salient Features - Preamble - Fundamental Rights – Directive Principles of State Policy - Fundamental Duties

UNIT II PARLIAMENTRY SYSTEM

Powers and Functions of President and Prime Minister - Council of Ministers - The Legislature Structure and Functions of Lok Sabha and Rajya Sabha – Speaker

UNIT III THE JUDICIARY

Organization and Composition of Judiciary - Powers and Functions of the Supreme Court - Judicial Review – High Courts.

UNIT IV STATE GOVERNMENTS

Powers and Functions of Governor and Chief Minister – Council of Ministers - State Legislature

UNIT V LOCAL GOVERNMENTS

73rd and 74th Constitutional Amendments – Federalism - Center – State Relations

Text Books

1. Basu D.D," Introduction to Indian Constitution", Prentice Hall of India, New Delhi, 2015.
2. Gupta D.C, "Indian Government and Politics", Vikas Publishing House, New Delhi, 2010.

Reference Books

1. Pylee M.V, "Introduction to the Constitution of India", Vikas Publishing House, New Delhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010

PROFESSIONAL ELECTIVES

U19CSE401	DATABASE ADMINISTRATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Learn Installing Oracle Software and create database.
- To study the SQL commands.
- To understand the memory structure and background process.
- To explore Database maintenance and monitoring process.
- To extract backup and recovery process.

Course Outcomes

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

CO1 - Install Oracle software and create the Oracle Database. **(K2)**
CO2 - Build queries using the SQL commands. **(K2)**
CO3 - Define and manage user access and security. **(K2)**
CO4 - Manage the storage structures. **(K3)**
CO5 - Design Database backup and recovery procedures. **(K3)**

UNIT I INTRODUCTION TO SQL *PLUS (9 Hrs)

Introduction: DBMS architecture and data independence – DBA roles and responsibilities – SQL *PLUS Overview: SQL Plus Fundamentals – Producing more readable outputs – Accepting values at runtime Using iSQL *Plus.

UNIT II DML STATEMENTS, CONSTRAINTS AND VIEWS (9 Hrs)

Introduction to DML Statements: Truncating a table – Transaction control language – Managing Constraints: Creating constraints – Dropping constraints – Enabling and disabling constraints – Defining Constraints Checks. Managing Views: Creating and modifying views – Using views – Inserting – Updating and deleting data through views.

UNIT III USER ACCESS AND SECURITY (9 Hrs)

Creating and modifying user accounts – Creating and using roles – Granting and revoking privileges – Managing user groups with profiles – Oracle Overview and Architecture: An overview of logical an physical storage structures – Oracle memory structures – Oracle background processes – Connecting to oracle instance – Processing SQL command.

UNIT IV MANAGING ORACLE (9 Hrs)

Starting up the oracle instance – managing sessions – shutting down the oracle instance – instances messages and instance alerts. Control and Redo Log Files: Managing the control files – Maintaining and monitoring redo log files. Managing Users and Security: Profiles – Managing users – managing privileges – managing roles – querying role information.

UNIT V INTRODUCTION TO NETWORK ADMINISTRATION (9 Hrs)

Network design considerations – Network responsibilities for the DBA – Network configuration – Overview of oracle Net features – Oracle Net Stack Architecture – Backup and Recovery Overview: Database backup – Restoration and recovery – Types of failure in oracle environment – Defining a backup and recovery strategy – Testing the backup and recovery plan.

Text Books

1. Craig S. Mullins, "Database Administration: The Complete Guide to DBA Practices and Procedures", 2012.
2. Chip Dawes, Biju Thomas, "Introduction to Oracle 9i SQL", BPB Publications, 2006.
3. C.J. Date, "Database Systems", Addison Wesley, 8th Edition, 2004.

Reference Books

1. Susan Lawson, "DB2 11 for z/OS Database Administration", 2016.
2. Bob Bryla, Biju Thomas, "Oracle 9i DBA Fundamental I", BPB Publications, 2006.
3. Donald K. Burleson, "Physical Database Design Using Oracle", 2004.
4. Doug Stums, Matthew Weshan, "Oracle 9i DBA Fundamental I", BPB, 2002.
5. Joseph C. Johnson, "Oracle 9i Performance Tuning", BPB, 2002.

Web References

1. https://www.udemy.com/course/ibm-db2-9-sql-and-database-administration-workshop/
2. https://www.tutorialspoint.com/listtutorials/oracle/dba-concepts/1
3. https://www.datacamp.com/courses/data-engineering-for-everyone
4. https://www.pluralsight.com/browse/it-ops/database-administration?
5. https://education.oracle.com/mysql/mysql-database-administration/product_159

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	2	1	2	3	1	2	1	3	2	2
2	3	3	2	2	2	2	1	2	3	3	2	1	2	3	2
3	3	3	2	-	2	-	1	2	3	1	2	1	3	2	2
4	3	2	2	3	2	2	1	2	2	2	2	2	2	1	2
5	2	2	1	2	3	3	1	1	2	2	1	3	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19CSE402	**E - BUSINESS**	3	0	0	3	45

Course Objectives

- To explore both the technical and business related implications of electronically medicated commerce.
- To enable the students to trace the development of E-Business from its origins in electronic data interchange to its current growing importance.
- To explore the potential of electronic business for future development and the development of the information society.
- To explore the authentication and authorization of online transactions.
- To introduce the strategy, culture, legal methods of establishing websites for business organizations.

Course Outcomes

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

CO1 - Demonstrate advanced knowledge of technical and business strategies related to E-Business and E-Commerce. **(K2)**

CO2 - Describe about the available secure electronic protocols. **(K3)**

CO3 - Identify the security issues and provide appropriate solutions to overcome. **(K3)**

CO4 - Evaluate Mobile Business and related technologies. **(K3)**

CO5 - Discuss contemporary technologies for globally distributed teams. **(K3)**

UNIT I ELECTRONIC COMMERCE ENVIRONMENT AND OPPORTUNITIES (9 Hrs)

Background – The Electronic commerce environment – Electronic marketplace technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to open EDI – Electronic commerce with WWW / Internet – Commerce net advocacy – Web commerce going forward.

UNIT II APPROACHES TO SAFE ELECTRONIC COMMERCE (9 Hrs)

Overview – Secure Transport Protocols – Secure transactions – Secure Electronic Payment Protocol (SEPP) – Secure Electronic Transaction (SET) – Certificates for authentication – Security on Web Servers and enterprise networks – Electronic cash and electronic payment schemes: Internet Monetary payment and security requirements – Payment and purchase order process - Online electronic cash.

UNIT III INTERNET / INTRANET SECURITY ISSUES AND SOLUTIONS (9 Hrs)

The need for computer security – Specific intruder approaches – Security strategies – Security tools – Encryption – Enterprise networking and Access to the Internet – Antivirus programs – Security Teams.

UNIT IV MASTERCARD/VISA SECURE ELECTRONIC TRANSACTION (9 Hrs)

Introduction – Business requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of email. MIME: Multipurpose Internet Mail Extensions. S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services.

UNIT V INTERNET AND WEBSITE ESTABLISHMENT (9 Hrs)

Introduction – Technologies for web servers – Internet tools relevant to commerce – Internet applications for commerce – Internet charges – Internet access and architecture – Searching the Internet – Case study.

Text Books

1. Daniel Minoli and Emma Minoli, "Web Commerce Technology Handbook", Tata McGraw-Hill, 2017.
2. Elias M. Awad , "Electronic Commerce from Vision to Fulfillment", PHI, Feb-2003.
3. Bharat Bhaskar, "Electronic Commerce – Framework, Technology and Application", TMH, 2003.

Reference Books

1. Bruce C. Brown, "How to Use the Internet to Advertise, Promote and Market Your Business or Website with Little or No Money", Atlantic Publishing Company, 2nd Edition, 2011.
2. Andrew B. Whinston, Ravi Kalakota, K. Bajaj and D. Nag, "Frontiers of Electronic Commerce", Tata McGraw-Hill, 2004.
3. Kamalesh K. Bajaj, "E-Commerce: The Cutting Edge & Business", Tata McGraw-Hill, 2003.
4. Brenda Kennan, "Managing your E-Commerce Business", PHI, 2001.
5. Jim A Carter, "Developing E-Commerce Systems", PHI, 2001.

Web References

1. https://nptel.ac.in/courses/110/105/110105083/
2. https://www.tutorialspoint.com/listtutorial/INTRODUCTION-TO-E-BUSINESS/6549.
3. https://en.wikipedia.org/wiki/Electronic_business

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	1	1	3
2	2	1	3	3	-	3	-	-	-	-	-	-	1	1	3
3	2	2	3	-	2	3	-	1	-	-	-	-	1	1	3
4	2	2	3	-	2	2	-	-	-	-	-	-	1	1	3
5	2	1	1	1	-	3	-	-	-	-	-	-	1	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSE403 OBJECT ORIENTED ANALYSIS AND DESIGN

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand objects, classes and inheritance.
- To learn the utilization of software objects to build software projects.
- To use UML in requirements elicitation and designing.
- To gain knowledge in the concepts of relationships and aggregations.
- To extract Object Oriented Analysis Processes.

Course Outcomes

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

CO1 - Analyze, design and document the requirements through use case driven approach. **(K4)**
CO2 - Categorize the different object oriented methodologies. **(K3)**
CO3 - Develop and Explore the Classes and Its Relationships. **(K4)**
CO4 - Apply the concepts of architectural design for view layer and access layer. **(K3)**
CO5 - Test for the software quality using different testing strategies. **(K4)**

UNIT I AN OVERVIEW OF OBJECT ORIENTED SYSTEM DEVELOPMENT (9 Hrs)

Introduction – Object Oriented System Development Methodology – Why object orientation – Overview of Unified Approach – Object Basics: Object oriented philosophy – Objects – Classes – Attributes – Object behavior and methods – Encapsulation and Information Hiding – Class hierarchy – Polymorphism – Object Relationships and Associations – Aggregations and Object Containment – Object Identity – Static and Dynamic Binding – Persistence. Object oriented systems development life cycle: Software development process – Building high quality software – Use case driven approach - Reusability.

UNIT II OBJECT ORIENTED METHODOLOGIES (9 Hrs)

Rumbaugh et al.'s Object modeling technique – Booch methodology – Jacobson et al. Methodologies – Patterns – Framework – Unified approach – Unified modeling language: Static and Dynamic Model – UML Diagrams – UML class diagram – UML use case diagram - UML dynamic modeling – UML extensibility – UML meta model.

UNIT III OBJECT ORIENTED ANALYSIS (9 Hrs)

Business object analysis – Use case driven object oriented analysis – Business process modeling – Use Case model - Developing Effective Documentation – Object Analysis Classification: Classification Theory – Noun Phrase Approach – Common Class Patterns Approach – Use Case Driven Approach – Classes Responsibilities and Collaborators – Naming Classes – Identifying Object Relationships – Attributes and Methods: Association – Super-Subclass Relationship – IS - A Relationship.

UNIT IV OBJECT ORIENTED DESIGN (9 Hrs)

Object Oriented Design Process – Object Oriented Design Axioms – Corollaries – Designing Classes: Object constraint language – Process of designing class – Class visibility – Refining attributes – Access Layer: Object store and Persistence – Database management system – Logical and Physical database-Organization and Access Control – Distributed Databases and Client Server Computing – Object Oriented Database Management System – Object Relational Systems – Designing Access Layer Classes – View Layer: Designing View Layer Classes – Macro Level Process – Micro Level Process – Purpose of View Layer Interface – Prototyping the user interface.

UNIT V SOFTWARE QUALITY (9 Hrs)

Software Quality Assurance: Quality Assurance Test – Testing strategies – Impact of object oriented testing – Test cases – Test Plan – Myers debugging principle. System usability and measuring user satisfaction: Usability testing – User satisfaction testing.

Text Books

1. John Deacon, "Object Oriented Analysis and Design", Addison Wesley, 1st Edition, 2012.
2. Grady Booch, James Rumbaugh, and Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley, 3rd Edition , 2011.
3. Ali Bahrami, "Object oriented systems development using the unified modeling language", McGraw-Hill, 1st Edition, 2008.

Reference Books

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Developmentl", Pearson Education, Third Edition, 2005.
2. Mike O'Docherty, "Object-Oriented Analysis & Design: Understanding System Development with UML 2.0", John Wiley & Sons, 2005.
3. Bernd Oestereich, "Developing Software with UML, Object - Oriented Analysis and Design in Practice", Addison-Wesley, 2nd Edition 2004.
4. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.
5. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.

Web References

1. www.omg.org
2. http://www.ibm.com/developerworks/rational/products/rose/
3. http://www.smartdraw.com/resources/tutorials/jacobson-oose-diagrams/
4. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
5. https://www.uml-diagrams.org/
6. https://nptel.ac.in/courses/106/105/106105153/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	3	2	3	2	3	0	1	2	2	2	2	2	3
2	3	2	3	1	3	2	2	0	2	3	1	2	2	2	3
3	3	2	2	1	2	1	2	0	1	1	1	2	2	1	3
4	3	2	3	3	3	1	2	0	2	1	2	2	2	2	3
5	3	3	3	2	2	1	2	0	2	3	3	3	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSE404 SCRIPTING LANGUAGES

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- Creation of programs in the Linux environment
- Create and run scripts using Perl
- Create and run scripts using TCL
- Gain Knowledge about the scripting languages such as PERL, TCL/TK
- Create and run scripts using Python

Course Outcomes

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

CO1 - Illustrate the basic concepts of Linux Administration. **(K2)**
CO2 - Explore the concepts of Perl **(K5)**
CO3 - Explore the concepts of TCL **(K5)**
CO4 - Understand the basic fundamentals of TK **(K2)**
CO5 - Working with programing concepts of Python **(K1)**

UNIT I INTRODUCTION TO LINUX (9 Hrs)

Introduction to Linux – File system of the Linux – General usage of Linux kernel & basic commands – Linux users and group – Permissions for file – directory and users – Searching a file & directory – zipping and unzipping concepts.

UNIT II INTRODUCTION TO PERL (9 Hrs)

Introduction to Perl Scripting, working with Simple Values – Lists and Hashes – Loops and Decisions – Regular Expressions, Files and Data in Perl Scripting.

UNIT III TCL FUNDAMENTALS (9 Hrs)

TCL Fundamentals – String and Pattern Matching – TCL Data Structures – Control Flow Commands.

UNIT IV WORKING OF TCL/TK COMMANDS (9 Hrs)

Introduction to TCLTK – Tk Fundamentals – String processing – functions and Regular Expressions – Arrays – Files – Tk by Examples

UNIT V PYTHON PROGRAMMING (9 Hrs)

Introduction to Python – History of Python – Features of Python – Simple Program in Python – Commenting in Python – Quotations in Python – Lines and Indentation – Multi-Line Statements – Input Operations – Output Operations.

Text Books

1. Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, Inc., 2010.
2. David Barron, "The World of Scripting Languages", 1st Edition, Wiley publications, 2009.
3. Brent Welch, Ken Jones, "Practical Programming in Tcl and Tk", Pearson; 4th Edition, 2003.

Reference Books

1. Randal L. Schwartz, "Learning Perl: Making Easy Things Easy and Hard Things Possible O'Reilly Publication", 7th Edition, 2016.
2. Daniel J. Barrett," Linux", 3rd Edition, O'Reilly Media, 2016.
3. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", O'Reilly Publication, 5th Edition, 2013.
4. Morgan Kaufmann, Clif Flynt, "Tcl/Tk: A Developer's Guide", 3rd Edition", 2012.
5. Paul Raines, Jeff Tranter, "Tcl/Tk in a Nutshell", O'Reilly Media, 1999.

Web References

1. http://www.bin-co.com/perl/perl_tk_tutorial/
2. https://www.tutorialspoint.com/tcl-tk/index.html
3. https://docs.python.org/3/tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	3	2	-	1	-	-	-	-	-	-	-	-	-
3	2	2	3	-	2	1	-	1	-	-	-	-	-	-	-
4	2	2	3	-	2	2	-	-	-	-	-	-	-	-	-
5	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSE405 FUNDAMENTALS OF PROGRAMMING LANGUAGES

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To Describe and classify various programming languages and data types.
- To summarize the sequence control.
- To Generalize various object oriented programming paradigms.
- To Discuss about Logical and functional programming.
- To summarize the concept of concurrent programming.

Course Outcomes

After completion of the course, the students will be able to
CO1 - To understand various programming and data types **(k2)**
CO2 - Apply various sequence control techniques of programming languages. **(k2)**
CO3 - To understand the object oriented programming. **(k2)**
CO4 - To analyse logical and functional programming. **(k3)**
CO5 - To understand about concurrent programming. **(k2)**

UNIT I INTRODUCTION (9 Hrs)

Introduction: Role of programming languages – Need to study programming languages – Characteristics of a good programming languages – Introduction to various programming paradigms: Procedural – Object-oriented – Logic and functional – Concurrent programming. Data Types: Properties of structured and non-structured data types and Objects – Variables – Constants – Derived and abstract data types – Declaration – Type checking. Binding and binding times – Type conversion – Scalar data type – Composite data types – Implementation and Storage representation of data types and control flow statement.

UNIT II SEQUENCE CONTROL (9 Hrs)

Sequence Control: Implicit and explicit sequence control – Sequencing with arithmetic and non-arithmetic expressions – Sequence control between statements. Subprograms control: Subprogram sequence control – Attributes of data control – Shared data in.

UNIT III OBJECT ORIENTED PROGRAMMING (9 Hrs)

Object Oriented Programming: The class declarations – Constructors – Information hiding and data abstraction using classes – Access specification – Inheritance – Polymorphism – Parameterized types – Exception handling.

UNIT IV LOGICAL AND FUNCTIONAL PROGRAMMING (9 Hrs)

Logic Programming: Logic programming language model – Logical statements – Resolution – unification – search structures: backward and forward – Applications of logic programming – PROLOG. Functional Programming: Features of functional languages – LISP – Applications of functional and logic programming languages.

UNIT V CONCURRENT PROGRAMMING (9 Hrs)

Basic concepts of Concurrent Programming: processes – Synchronization primitives – Safety and liveness properties – Parallelism in Hardware – Streams – Concurrency as interleaving – Safe access to shared data.

Text Books

1. Richard Fairley," Software Engineering Concepts", Tata Macgraw Hill, 2006.
2. Sethi R., "Programming Languages concepts & constructs", 2nd Edition, Pearson Education, 2006.
3. Terrance W. Pratt, and Marvin V. Zelkowitz, "Programming Languages, Design and Implementation", Prentice-Hall of India, Fourth Edition, 2002.

Reference Books

1. Ghezzi C, Milano P., Jazayeri M., "Programming Languages Concepts", Pearson, 11th Edition, 2016
2. Scbesta R., "Concepts of Programming Languages", Pearson Education, 10th Edition, 2013.
3. Roosta S., "Foundations of Programming Languages", Cengage, 1st Edition, 2009.
4. M. Ben Ari, "Principles of Concurrent and Distributed Programming, Pearson, 2nd Edition, 2005.
5. Robert W. Sebesta, "Concepts of Programming Languages", Addison Wesley, Sixth Edition, 2003.

Web References

1. www,nptel.ac.in/Fundamentals of Programming Language.
2. https://www.edx.org/learn/computer-programming.
3. https://www.classcentral.com/course/programming1-385.
4. www.greeksforgreeks.org/Fundamentals of Programming Language.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	2	2	2	-	-	3	-	3	2	3	2
2	3	3	3	2	3	2	2	-	-	-	-	3	3	3	2
3	3	3	3	2	3	2	2	-	-	2	-	3	3	3	3
4	2	2	2	2	2	2	2	-	-	2	-	2	2	2	2
5	3	3	2	2	2	2	2	-	2	3	3	3	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

OPEN

ELECTIVES

		L	T	P	C	Hrs
U19EEO42	**ELECTRICAL SAFETY** (Common to ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT)	3	0	0	3	45

Course Objectives

- To familiarize the Indian Electricity Rules and Act related with electrical safety.
- To provide a knowledge about electrical shocks and safety precautions.
- To create awareness of the electrical safety associated with installation of electrical equipment.
- To analyze different Hazardous areas for electrical safety.
- To expose knowledge about necessity of safety policy and safety management.

Course Outcomes

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

CO1 - Describe the Indian Electricity (IE) acts and various rules for electrical safety. **(K2)**

CO2 - Expose safety measures to prevent electrical shock in handling of domestic electrical appliances. **(K3)**

CO3 - Evaluate the safety aspects during installation of plant and equipment. **(K3)**

CO4 - Describe the various hazardous area and application of electrical safety in various places. **(K3)**

CO5 - Acquire knowledge about importance of electrical safety training to improve quality management in electrical systems. **(K3)**

UNIT I CONCEPTS AND STATUTORY REQUIREMENTS (9 Hrs)

Objective and scope of electrical safety - National electrical Safety code - Statutory requirements – Indian Electricity acts related to electrical Safety - Safety electrical one line diagram - International standards on electrical safety safe limits of current and voltage - Grounding of electrical equipment of low voltage and high voltage systems - Safety policy - Electrical safety certificate requirement

UNITII ELECTRICAL SHOCKS AND THEIR PREVENTION (9 Hrs)

Primary and secondary electrical shocks - Possibilities of getting electrical shock and its severity - Effect of electrical shock of human being - Shocks due to flash/ Spark over's - Firing shock - Multi storied building - Prevention of shocks - Safety precautions - Safe guards for operators - Do's and Don'ts for safety in the use of domestic electrical appliances - Case studies on electrical causes of fire and explosion

UNIT III SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE (9 Hrs)

Need for inspection and maintenance - Preliminary preparations - Field quality and safety - Personal protective equipment - Safe guards for operators - Safety equipment - Risks during installation of electrical plant and equipment - Effect of lightning current on installation and buildings - Safety aspects during installation -Safety during installation of electrical rotating machines - Importance of earthing in installation– Agricultural pump installation

UNIT IV HAZARDOUS ZONES (9 Hrs)

Primary and secondary hazards - Hazardous area classification and of electrical equipments (IS, NFPA, API and OSHA standards) - Explosive gas area classifications: Class I(Division 1) - Zone 0, Zone 1, zone 2 classified locations, Design Philosophy for Equipment and installations-Classification of equipment enclosure for various hazardous gases and vapors - flash hazard calculation and approach distances- calculating the required level of arc protection

UNIT V SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS (9 Hrs)

Principles of Safety Management - Occupational safety and health administration standards - Safety organization - Safety auditing - Employee electrical safety teams - Electrical safety training to improve Quality management - Total quality control and management – Importance of high load factor - Causes of low power factor - Disadvantages of low power factor - Power factor improvement - Importance of P.F. improvement - Case studies of electrical workplace safety practices.

Text books

1. John Cadick, Mary CapelliSchellpfeffer, Dennis Neitzel, Al Winfield, "Electrical Safety Handbook", McGraw-Hill Education, 4th Edition, 2012.
2. Madden, M. John, "Electrical Safety and the Law: A Guide to Compliance", Wiley publications, 4th Edition, 2002.
3. Mohamed A. El-Sharkawi, "Electric Safety: Practice and Standards", CRC Press; 1st Edition, 2013.

Reference books

1. Rob Zachariason, "Electrical Safety", Delmar Cengage Learning, 1st Edition, 2011.
2. Peter E. Sutherland, "Principles of Electrical Safety", Wiley-IEEE Press; 1st Edition, 2014.

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2. https://safetyculture.com/topics/electrical-hazards/
3. https://www.jove.com/science-education/10114/electrical-safety-precautions-and-basic-equipment
4. https://electrical-engineering-portal.com/21-safety-rules-for-working-with-electrical-equipment
5. https://www.electrical4u.com/safety-precautions-for-electrical-system/
6. https://www.constellation.com/energy-101/electrical-safety-tips.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
2	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
3	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
4	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
5	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19ECO42	**CONSUMER ELECTRONICS** (Common to EEE, ICE, CSE MECH, IT, CIVIL, CCE, BME, Mechatronics, FT)	3	0	0	3	45

Course Objectives

- To enable thetroubleshoot of different types of microphones and loudspeakers
- To make the students to analyse the working of digital console, digital FM tuner and troubleshoot audio systems
- To train to test the working of various colour TV
- To empower them to troubleshoot colour TV receivers
- To equip them to maintain various electronic home and office appliances

Course Outcomes

After completion of the course, students will be able to

CO1 -Describe the fundamental audio characteristics and measurements, operating principles of microphone and loudspeaker (K1)

CO2 -Explain the working of digital console, digital FM tuner and troubleshoot the audio systems (K2)

CO3 -Distinguish the salient features of colour TV and Monochrome and troubleshoot TV camera (K2)

CO4 -Demonstrate various interfaces in digital TV, the working of DTH receiver, CD/DVD players (K3)

CO5 -Explain the working of FAX, Microwave oven, Washing machine, Air conditioner, Refrigerators and camera (K2)

UNIT I AUDIO FUNDAMENTALS AND DEVICES (9Hrs)

Basic characteristics of sound signal, Microphone- working principle, sensitivity, nature of response. Types of Microphone. Loud speaker- working principle, Woofers and Tweeters, characteristics.Types of Loudspeaker. Sound recording

UNITII AUDIO SYSTEMS (9Hrs)

Introduction to audio system, Digital Console- Block diagram, working principle,applications, FM tuner- concepts of digital tuning, ICs used in FM tuner TD702IT, PA address system- Planning, speaker impedance matching, characteristics, Power amplifier specification

UNIT III TELEVISION SYSTEMS (9Hrs)

Monochrome TV standards, Components of TV system, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal,Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera.

UNIT IV TELEVISION RECEIVERS AND VIDEO STANDARDS (9Hrs)

Colour TV receiver- block diagram, Digital TVs- LCD, LED , PLASMA, HDTV, 3-D TV, projection TV, DTH receiver, Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI, Digital Video Interface, CD and DVD player: working principles, interfaces

UNIT V HOME AND OFFICE APPLIANCES (9Hrs)

Microwave Oven: Types, technical specifications. Washing Machine: hardware and software. Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices, picture processing, picture storage

Text Books

1. Bali S.P. , 'Consumer Electronics', **copyright 2008**,Pearson Education India.
2. Bali R and Bali S.P. 'Audio video systems : principle practices & troubleshooting', Khanna Book Publishing Co. (P) Ltd
3. Gulati R.R., 'Modern Television practices', 5th edition, 2015, New Age International Publication (P) Ltd.

Reference Books

1. Gupta R.G., 'Audio video systems', 2nd edition,2017, Tata Mcgraw Hill, New Delhi, India
2. Whitaker Jerry & Benson Blair, 'Mastering Digital Television', McGraw-Hill Professional, 2006
3. Whitaker Jerry & Benson Blair, 'Standard handbook of Audio engineering', 2nd edition,2002, McGraw-Hill Professional

Web Resources

1. http://www.scientificamerican.com/article.cfm?id = experts.bluetooth-work
2. http://www.cosc.brocku.ca/Offerings/3P92/seminars/HDTV.ppt
3. http://www.circuitstoday.com/blu-ray-technology-working
4. http://www.freevideolectures.com

COs Mapping with POs and PSOs

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
2	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
3	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
4	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
5	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19CSO41	**WEB DEVELOPMENT** (Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To study the fundamentals of web application development
- To understand the design components and tools using CSS
- To learn the concepts JavaScript and programming fundamentals.
- To study about advance scripting and Ajax applications.
- To understand the working procedure of XML

Course Outcomes

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

CO1 - Develop basic web applications. **(K5)**
CO2 - Design the web applications using CSS. **(K5)**
CO3 - Validate the web pages using javascripts functions. **(K5)**
CO4 - Demonstrate the web 2.0 application to advance scripts. **(K3)**
CO5 - Update the knowledge of XML Data. **(K4)**

UNIT I INTRODUCTION TO WWW & HTML (9 Hrs)

Protocols – Secure Connections – Application and development tools – Web browser – Server definition – Dynamic IP. Web Design: Web site design principles – Planning the site and navigation. HTML: Development process – Html tags and simple HTML forms – Web site structure.

UNIT II STYLE SHEETS (9 Hrs)

Introduction to CSS: Need for CSS – Basic syntax and structure using CSS – Background images – Colors and properties – Manipulating texts using fonts, borders and boxes – Margins, padding lists, positioning using CSS – CSS2.

UNIT III JAVASCRIPTS (9 Hrs)

Client side scripting: Basic JavaScript – Variables – Functions – Conditions – Loops. Applications: Page Validation – Reporting.

UNIT IV ADVANCE SCRIPT (9 Hrs)

JavaScript and objects – DOM and Web browser environments – Forms and Validations – DHTML. AJAX: Introduction – Web applications – Alternatives of AJAX.

UNIT V XML (9 Hrs)

Introduction to XML – Uses of XML – Simple XML – XML key components – DTD and Schemas – Well-formed XML document – Applications of XML – XSL and XSLT.

Text Books

1. Keith Wald, Jason Lengstorf," Pro PHP and jQuery", Paperback, 2016.
2. Semmy Purewal, "Learning Web App Development", O'Reilly Media, 2014.
3. P.J. Deitel AND H.M. Deitel," Internet and World Wide Web - How to Program", Pearson Education, 2009.

Reference Books

1. Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, "Enterprise Web Development ", O'Reilly Media, 2014.
2. Steven Suehring, Janet Valade, "PHP, MySQL, JayaScript & HTML5 All-in-One", John Wiley & Sons, Inc, 2013.
3. UttamK.Roy, "Web Technologies", Oxford University Press, 2010.
4. Rajkamal, "Web Technology", Tata McGraw-Hill, 2009.
5. Shklar, Leon, Rosen, Rich, "Web Application Architecture: Principles, Protocols and Practices", Wiley Publication, 2009.

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2. https://www.geeksforgeeks.org/web-technology/
3. https://www.guru99.com/cakephp-tutorial.html
4. https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business
5. http://Oriel.ly/learning-web-app

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
2	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
5	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19CSO42

ANALYSIS OF ALGORITHMS

(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)

L	T	P	C	Hrs
3	0	(	3	45

Course Objectives

- To analyze the performance of algorithms in terms of time and space complexity.
- To understand the performance of the algorithms such as divide and conquer, greedy method
- To solve problems using Dynamic Programming and derive the time complexity.
- To solve problems using Backtracking technique and derive the time complexity.
- To solve problems using Branch and Bound technique and derive the time complexity.

Course Outcomes

Upon completion of the course, students shall have ability to

CO1 - Choose the appropriate data structure and algorithm design method for a specified application.**(K2)**

CO2 - Ability to understand the design technique such as divide and conquer, greedy method applied to realistic problems and analyse them. **(K3)**

CO3 - Ability to understand the dynamic programming design technique and how it is applied to realistic problems and analyze them. **(K3)**

CO4 - Ability to understand the backtracking design technique and how it is applied to realistic problems and analyze them. **(K3)**

CO5 - Ability to understand Branch and Bound design technique and how it is applied to realistic problems and analyze them. **(K2)**

UNIT I INTRODUCTION

(9 Hrs)

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis – Time complexity, Space complexity, Asymptotic Notation – Big oh notation, Omega notation, Theta notation and Little oh notation.

UNIT II DIVIDE AND CONQUER METHOD AND GREEDY METHOD

(9 Hrs)

Divide and Conquer method: Applications – Binary search, Merge sort, Quick sort. Greedy method: General method, applications – Knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING

(9 Hrs)

Dynamic Programming: Applications - Multistage graphs, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT IV BACKTRACKING

(9 Hrs)

Backtracking: General method, Applications – N-queen problem, Sum of subsets problem, Graph Coloring – Hamiltonian Cycles.

UNIT V BRANCH AND BOUND

(9 Hrs)

Branch and Bound: General method, Applications – Traveling sales person problem, 0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution.

Text Books

1. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", PHI/Pearson Education, 3rd Edition, 2009.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.

Reference Books

1. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India, 2006.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education Asia, 3rd Edition, 2010.
3. Donald E Knuth, "The Art of Computer Programming, Volume I & II", Addison Wessely, Third Edition, 2011.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2006.
5. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.

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2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
3. https://www.javatpoint.com/daa-tutorial
4. https://www.guru99.com/design-analysis-algorithms-tutorial.html
5. https://www.geeksforgeeks.org/fundamentals-of-algorithms/

COs/POs/PSOs Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	3	2	3	3	2	2	1	-	-	-	-	-	2	1	2
3	3	3	3	3	2	2	2	-	2	-	-	-	2	1	2
4	3	2	3	3	3	2	2	-	-	-	3	-	2	1	2
5	3	3	3	3	2	2	2	-	-	-	3	2	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19ICO41

SENSORS AND TRANSDUCERS

(Computer Science Engineering)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- Get to know the methods of measurement, classification of transducers and to analyze error.
- Get exposed to different types of resistive transducers and their application areas
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on variety of transducers
- To introduce about advancements in sensor technology.

Course Outcomes

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

CO1 - Understand the concepts of classification of Transducers. **(K2)**
CO2 - Familiar with the working of resistance Transducer. **(K3)**
CO3 - Familiar with the principle and working of various Inductive and Capacitive transducer. **(K1)**
CO4 - Able to design signal conditioning circuit for various transducers. **(K3)**
CO5 - Able to identify or choose a transducer for a specific measurement application. **(K4)**

UNIT I CLASSIFICATION OF TRANSDUCERS

(9 Hrs)

General concepts and terminology of measurement systems, transducer classification, general input-output configuration, static and dynamic characteristics of a measurement system, Statistical analysis of measurement data.

UNIT II RESISTANCE TRANSDUCERS

(9 Hrs)

Resistive transducers: Potentiometers, metal and semiconductor strain gauges and signal conditioning circuits, strain gauge applications: Load and torque measurement, Digital displacement sensors.

UNIT III INDUCTIVE AND CAPACITIVE TRANSDUCERS

(9 Hrs)

Transducers: – Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer – Variable reluctance transducers – Synchros – Microsyn – Principle of operation, construction details, characteristics of capacitive transducers – Different types & Signal Conditioning – Applications:- Capacitor microphone, Capacitive pressure sensor, Proximity sensor.

UNIT IV OTHER TRANSDUCERS

(9 Hrs)

Piezoelectric transducers and their signal conditioning, Seismic transducer and its dynamic response, photoelectric transducers, Hall effect sensors, Magnetostrictive transducers. Eddy current transducers. Hall effect transducers – Optical sensors, IC sensor for temperature – signal conditioning circuits, Introduction to Fiber optic sensors – Temperature, pressure, flow and level measurement using fiber optic sensors

UNIT V SMART TRANSDUCER

(9 Hrs)

Introduction to semiconductor sensor, materials, scaling issues and basics of micro fabrication. Smart sensors, Intelligent sensor, Mems Sensor, Nano-sensors, SQUID Sensors- Environmental Monitoring sensors

Text Books

1. Doebelin E.O. and Manik D.N., "Measurement Systems", 6th Edition, McGraw-Hill Education Pvt. Ltd., 2011.
2. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge,2003
3. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design Clarendon, Oxford 2nd edition Jacob Fraden - 2010
4. Doeblin E..O. "Measurement System Applications and Design", TMH, 5th Edition, 2004.

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1. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol.1 ISA/CRC Press, 2003.
2. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th edition, Vol.2 ASME PTC ,2018
3. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
4. John P. Bentley, Principles of Measurement Systems, 3rd Edition, Pearson Education, 2000.

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3. https://www.youtube.com/watch?v=1uPTyjxZzyo

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	2	-	-	1	2	-	-	-	2	-	-	-	-
2	2	-	3	-	-	1	2	-	-	-	2	-	-	-	-
3	2	-	2	-	-	1	2	-	-	-	2	-	-	-	-
4	2	-	3	-	-	1	2	-	-	-	-	-	-	-	-
5	2	-	3	-	2	2	3	-	-	-	2	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19ICO42	**CONTROL SYSTEM ENGINEERING** (Computer Science Engineering)	3	0	0	3	45

Course Objectives

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems
- To introduce stability analysis of control systems.
- To introduce compensation technique.

Course Outcomes

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

CO1 - Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form. **(K2)**
CO2 - Perform time domain analysis of various models of linear system **(K3)**
CO3 - Do frequency domain analysis of various models of linear system **(K4)**
CO4 - Determine and analyse the stability of the system **(K4)**
CO5 - Design the compensation technique that can be used to stabilize control systems. **(K3)**

UNIT I SYSTEM CONCEPTS

(9 Hrs)

Types of system – open loop systems, closed loop systems, Basic elements in control system – Mathematical models of physical system: Differential equation- transfer functions of simple electrical networks – D.C and A.C servo motor – Mechanical system- Translational and Rotational system – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE ANALYSIS

(9 Hrs)

Standard test signals -Time response of first and second order system, Time domain- specifications- Generalized error series – Steady state error and error constants

UNITIII FREQUENCY RESPONSE ANALYSIS

(9 Hrs)

Frequency response of the system – Correlation between time and frequency response – Gain and Phase margin – Bode plot, Polar Plot.

UNIT IV STABILITY ANALYSIS

(9 Hrs)

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Nyquist stability criterion.

UNIT V COMPENSATION NETWORKS

(9 Hrs)

Introduction to compensation networks - Lag, Lead and Lag Lead networks - Effect of providing Lag, Lead and Lag-Lead compensation on system performance and design using bode plot

Text Books

1. Nagrath I J and Gopal M, Control System Engineering, New Age International Pvt Ltd, Sixth Edition, 2017
2. Ogata K, —Modern Control EngineeringI, Prentice-Hall of India Pvt Ltd., New Delhi, Fifth Edition, 2015.

Reference Books

1. Norman S Nise, Control System Engineering , John Wiley and sons, inc., Seventh Edition, 2015
2. Benjamin C Kuo, —Automatic Control SystemsI, Prentice Hall India Pvt. Ltd, Ninth Edition, 2015
3. Smarajith Ghosh, —Control Systems Theory and ApplicationsI, Pearson Education, Singapore, Sixth Edition, 2015
4. Richard C. Dorf, Robert H Bishop, —Modern Control SystemsI, Pearson Education, Twelfth Edition, 2017

Web References

1. https://lecturenotes.in/notes/6579-note-for-control-system-engineering-cse-by-gyana-ranjan-biswal
2. https://www.smartzworld.com/notes/control-systems-pdf-notes-cs/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	2	2	1	-	-	1	1	1	2	-	-	-
2	2	3	2	2	1	2	1	1	1	1	1	2	-	-	-
3	2	2	1	2	2	1	1	-	-	1	-	1	-	-	-
4	2	2	1	2	2	1	1	-	-	1	-	1	-	-	-
5	3	3	2	2	2	1	1	-	1	-	1	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19BMO41	**MEDICAL ELECTRONICS** (Common to EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS)	3	0	0	3	45

Course Objectives

- To gain knowledge about the various physiological parameters measurements
- To understand the various biochemical and nonelectrical sensors
- To study about the assist devices
- To gain knowledge on surgical equipments and telemetry in healthcare
- To understand the concepts of recent advancements in healthcare

Course Outcomes

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

CO1 - Explain the electro- physiological parameters and bio-potentials recording **(K2)**
CO2 - Measure the biochemical and non-electrical physiological parameters **(K2)**
CO3 - Interpret the various assist devices used in the hospitals **(K3)**
CO4 - Identify physical medicine methods and biotelemetry **(K3)**
CO5 - Analyse recent trends in medical instrumentation **(K3)**

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING (9 Hrs)

Sources of bio medical signals, Bio-potentials, Bio potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT (9 Hrs)

pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES (9 Hrs)

Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters, Heart-Lung Machine.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY (9 Hrs)

Diathermies - Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry - Single Channel and Multiple Channel.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION (9 Hrs)

Telemedicine, Insulin Pumps, Radio pill, Endo-microscopy, Brain machine interface, Lab on a chip, Cryogenic Technique.

Text Books

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2011.
2. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2017.
3. John G.Webster, "Medical Instrumentation Application and Design", Third Edition, Wiley India , 2012.

Reference Books

1. Joseph J.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2011.
2. R.Anandanatarajan, "Biomedical Instrumentation and Measurements", Second Edition, PHI Learning, 2016.
3. Mandeep singh, "Introduction to Biomedical Instrumentation", Second Edition, Prentice Hall of India, New Delhi,2014
4. Shakti Chatterjee, Aubert Miller, "Biomedical Instrumentation Systems", Cengage Learning, 2012
5. C.Raja Rao, Sujoy K.Guha, " Principles of Medical Electronics and Biomedical Instrumentation", Universities Press, 2010

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1. https://www.nap.edu/read/21794/chapter/7
2. https://www.embs.org/about-biomedical-engineering/our-areas-of-research/diagnostic-therapetic systems
3. https://nptel.ac.in/courses/127/106/127106136/
4. medicinenet.com/script/main/art.asp?articlekey=6414
5. https://www.verywellhealth.com/cardiopulmonary-bypass-machine-used-for-surgery-3157220

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	2	2	2	-	1	-	-	-	-	1	-	-
2	3	2	-	2	2	2	-	1	-	-	-	-	1	-	-
3	3	-	-	2	3	3	-	1	-	-	-	-	1	-	-
4	3	-	2	2	3	2	-	1	-	-	-	-	1	-	-
5	3	2	2	3	3	2	-	1	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19BMO42	**TELEMEDICINE**	**L**	**T**	**P**	**C**	**Hrs**
	(Common to EEE, ECE, CSE, IT, ICE, CCE, AI&DS)	**3**	**0**	**0**	**3**	**45**

Course Objectives:

- To understand the classification of telemetry.
- To gain knowledge about biotelemetry principles
- To know about the applications of telemetry in various fields
- To provide the idea about the value of telemedicine
- To know the various applications in telemedicine.

Course Outcomes:

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

CO1 - Categorize the telemetry systems **(K2)**
CO2 - Understand the principles of biotelemetry in transmission of biological signals **(K3)**
CO3 - Apply the various Biotelemetry applications for diagnostics **(K3)**
CO4 - Acquire clear idea about the fundamentals of telemedicine **(K2)**
CO5 - Know about various applications of telemedicine **(K3)**

UNIT I INTRODUCTION TO TELEMETRY (9 Hrs)

Basic system, Classification, Non electrical telemetry systems, Mechanical and Pneumatic type, Voltage and Current telemetry systems, Local transmitters and Converters, Frequency telemetry system, Power Line carrier communication (PLCC).

UNIT II BIOTELEMETRY (9 Hrs)

Radio Telemetry principles, FM, AM, PCM, Transmission of biological data through radio telemetry.

UNIT III APPLICATION OF BIOTELEMETRY (9 Hrs)

Wireless Telemetry - Single Channel and Multi-channel Telemetry systems, Multi Patient Telemetry, Implantable Telemetry Systems, Ambulatory patient monitoring.

UNIT IV FUNDAMENTALS OF TELEMEDICINE (9 Hrs)

History and advancements in telemedicine, Benefits of telemedicine, Functional Block of a telemedicine system, Use of computers in distance mode of healthcare delivery, Familiarizing with technology of telemedicine, scanner, electro stethoscope, data reception equipment, Scope for telemedicine, Limitations of telemedicine.

UNIT V APPLICATIONS OF TELEMEDICINE (9 Hrs)

Telemedicine in Neuroscience, Telecardiology, Telepathology, Telepediatrics, Telepharmacy, Telepsychiatry and mental health, Veterinary.

Text Books

1. Marilyn J. Field , "A Guide to Assessing Telecommunications in Health Care", Fourth Edition, Academy Press,2011.
2. Bashshur , R. L. , Sanders, J. H and Shannon, G, "Telemedicine: Theory and Practice", Eight Edition, Springer,2014.
3. Olga (EDT), Ferre Roca, M. Sosa, "Handbook of Telemedicine", Third Edition, IOS press 2009.

Reference Books

1. Bemmel, J.H. van, Musen, M.A. (Eds.), "Handbook of Medical Informatics", Second Edition, Springer, 2010.
2. Simpson, W, "Video over IP. A practical guide to technology and applications'", Ninth Edition, Focal Press, Elsevier, 2009.
3. Ferrer-Roca, O., Sosa-Iudicissa, , "Handbook of Telemedicine", IOS Press, 2012
4. Norris, A.C, "Essentials of Telemedicine and Telecare", Eight Edition, Wiley, 2017
5. Wotton, R., Craig, J., Patterson, V. (Eds.), "Introduction to Telemedicine", Fifth Edition, Royal Society of Medicine Press Ltd., 2014.

Web References

1. https://en.wikipedia.org/wiki/Biotelemetry
2. https://www.who.int/goe/publications/goe_telemedicine_2010.pdf
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5927731/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	-	-	2	1	-	1	-	2	-	-	-	-	-
2	3	2	-	-	2	1	-	1	-	2	-	-	-	-	-
3	3	2	3	2	2	1	-	1	-	2	-	-	2	-	-
4	3	2	-	2	2	1	-	1	-	2	-	-	2	-	-
5	3	2	3	2	2	1	-	1	-	2	-	-	2	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U19CCO42	**INTRODUCTION TO COMMUNICATION SYSTEMS** (Common to EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME)	3	0	0	3	45

Course Objectives

- To provide basic knowledge of signals
- To study the various analog and digital modulation techniques
- To study the pulse modulation and multiplexing
- To infer Digital transmission techniques
- To provide knowledge about various multiple access technology and advanced communication techniques

Course Outcomes

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

CO1- Comprehend the basic Characteristics of the signals.(**K2**)
CO2- Comprehend needs of modulation and various analog modulation techniques (**K2**)
CO3- Illustrate pulse modulation and multiplexing (**K3**)
CO4- Explain Digital transmission techniques (**K2**)
CO5- Describe multiple access techniques and advanced communication systems.(**K2**)

UNIT I SIGNAL ANALYSIS (9 Hrs)

Introduction to Signals- Representation and classification of Signals, Representation of signal in frequency domain, introduction to Spectrum of signal- Introduction to Fourier series and Fourier Transform.

UNIT II ANALOG COMMUNICATION (9 Hrs)

Need for Modulation— Block diagram of analog communication System- Amplitude Modulation – AM, DSBSC, SSBSC, modulators and demodulators – Angle modulation – PM and FM – modulators and demodulators – Superheterodyne receivers.

UNIT III PULSE COMMUNICATION (9 Hrs)

Low pass sampling theorem – Quantization – PAM – PCM, DPCM, DM, and ADPCM And ADM - Time Division Multiplexing, Frequency Division Multiplexing.

UNIT IV DIGITAL COMMUNICATION (9 Hrs)

Comparison of digital and analog communication system- Block diagram of digital communication system Phase shift keying – BPSK, DPSK, QPSK.

UNIT V MULTIPLE ACCESS TECHNIQUES AND ADVANCED COMMUNICATION (9 Hrs)

Multiple Access techniques- FDMA, TDMA, CDMA- Frequency reuse, Handoff- Block diagram of advanced communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

Text Books

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", 3rd edition, TMH 2007
2. S. Haykin, "Digital Communications", John Wiley, 2005.
3. B.P.Lathi," Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007.

Reference Books

1. H P Hsu, Schaum Outline Series, "Analog and Digital Communications", TMH 2006
2. B.Sklar," Digital Communications Fundamentals and Applications", 2nd edition Pearson Education 2007.
3. A.Bource Carson and Paul B.Crilly, "Communication Systems", 5th Edition, Mc Graw Hill, 2010
4. Torrieri, Don, "Principles of Spread Spectrum Communication Systems", Springer, 2015
5. Simon Haykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001.

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1. www.allaboutcircuits.com
2. https://nptel.ac.in/courses/108/102/108102096/
3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
2	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
3	3	3	1	-	1	-	-	-	-	-	1	1	-	-	1
4	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
5	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19ADO41	**KNOWLEDGE REPRESENTATIONS AND REASONING**	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To investigate the key concepts of knowledge representation (KR) techniques and different notations.
- To integrate the KR view as knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques.
- To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes

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

CO1 - Analyse and design knowledge based systems intended for computer implementation. **(K3)**

CO2 - Acquire theoretical knowledge about principles for logic-based representation and reasoning. **(K2)**

CO3 - Ability to understand knowledge-engineering process. **(K2)**

CO4 - Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and algorithmic decision-making. **(K2)**

UNIT I (9 Hrs)

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic. Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT II (9 Hrs)

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time.

UNIT III (9 Hrs)

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.

UNIT IV (9 Hrs)

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT V (9 Hrs)

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics. Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition.

Text Books

1. John F. Sowa, Thomson Learning "Knowledge Representation logical, Philosophical, and Computational Foundations", Course Technology Inc. publication, 1999.
2. Ronald J. Brachman, Hector J. Levesque,"Knowledge Representation and Reasoning", Morgan Kaufmann; 1st edition, 2004.
3. Eileen Cornell Way "Knowledge Representation and Metaphor" Springer; 1991st edition, 1991.

Reference Books

1. Trevor Bench-Capon, "Knowledge representation: an approach to artificial intelligence", Academic Press, 2014.
2. Yulia Kahl, Michael Gelfond "Knowledge Representation, Reasoning, and the Design of Intelligent Agents The Answer-Set Programming Approach", Cambridge University Press; 1st edition, 2014.
3. Arthur B. Markman, "Knowledge representation" Psychology Press; 1st edition, 1998.
4. Sanida Omerović, Grega Jakus, V. Milutinovic, Sašo Tomažič "Concepts, Ontologies, and Knowledge Representation" Springer; 2013.
5. Bernhard Nebel, Gerhard Lakemeyer "Foundations of Knowledge Representation and Reasoning" Springer, 1994.

Web References

1. https://www.javatpoint.com/knowledge-representation-in-ai
2. https://nptel.ac.in/courses/106/106/106106140/
3. https://www.youtube.com/watch?v=kXlr6ydiPAQ

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	1	3	-	-	-	-	-	-	-	2	1	3
2	2	3	2	3	2	-	-	-	-	-	-	-	2	1	3
3	1	3	1	2	2	-	-	-	-	-	-	-	2	1	3
4	1	2	1	2	1	-	-	-	-	-	-	-	2	1	3
5	2	1	3	1	3	-	-	2	-	-	-	-	2	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19ADO42 INTRODUCTION TO DATA SCIENCE

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To learn the basics of data science
- To enable the students to understand the statistics and probability.
- To understand the tools in developing and visualizing data.
- To gain good knowledge in the application areas of data science.
- To inculcate the perceiving, ethics surrounding privacy and acting of data science applications.

Course Outcomes

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

CO1 - Explore the fundamental concepts of data science. **(K2)**

CO2 - To understand the Mathematical Knowledge for Data Science.**(K2)**

CO3 - Visualize and present the inference using various tools. **(K3)**

CO4 - To expose the different opportunities in Industries. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and decision-making. **(K2)**

UNIT I INTRODUCTION TO DATA SCIENCE (9 Hrs)

Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation..

UNIT II MATHEMATICAL PRELIMINARIES (9 Hrs)

Probability: Probability vs. Statistics – Compound Events and Independence – Conditional Probability – Probability Distribution. Descriptive Statistics: Centrality Measures – Variability Measures - Interpreting Variance – Characterizing Distributions. Correlation Analysis: Correlation Coefficient – The Power and Significance – Detection Periodicities. Logarithms: Logarithms and Multiplying Probabilities – Logarithms and Ratios – Logarithms and Normalizing Skewed Distributions.

UNIT III DATA SCIENCE TOOLS (9 Hrs)

Introduction to Data Science Tool – Data Cleaning Tools – Data Munging and Modelling Tools – Data Visualization Tools – Tools for Data Science.

UNIT IV INDUSTRIALIZATION, OPPURTUNITIES AND APPLICATIONS (9 Hrs)

Data Economy and Industrialization – Introduction: Data Economy, Data Industry, Data Services – Data Science Application: Introduction, General Application Guidance - Different Domain – Advertising – Aerospace and Astronomy – Arts, Creative Design and Humanities – Bioinformatics – Consulting Services – Ecology and Environment – Ecommerce and Retail - Education – Engineering – Finance and Economy – Gaming.

UNIT V ETHICS AND RECENT TRENDS (9 Hrs)

Data Science Ethics – Doing good data science – Owners of the data - Valuing different aspects of privacy - Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends.

Text Books

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications Co., 1st edition, 2016.
2. Chirag Shah, "A Hands on Introduction to Data Science", Cambridge University Press, 2020.
3. SinanOzdemir, "Principles of Data Science", Packt Publication, 2016.
4. D J Patil, Hilary Mason, Mike Loukides, "Ethics and Data Science", O' Reilly, 1st edition, 2018.

Reference Books

1. Hector Guerrero, "Excel Data Analysis: Modeling and Simulation", Springer International Publishing, 2nd Edition, 2019.
2. Paul Curzon, Peter W. Mc Owan, "The Power of Computational Thinking", World Scientific Publishing, 2017.
3. Steven S. Skiena, "Data Science Design Manual", Spring International Publication, 2017.
4. Rajendra Akerkar, Priti Srinivas Sajja, "Intelligence Techniques for Data Science", Spring International Publication, 2016.
5. Longbing Cao "Data Science Thinking: The Next Scientific, Technological and Economic Revolution", Spring International Publication, 2018.

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1. https://www.youtube.com/watch?v=-ETQ97mXXF0&ab_channel=edureka%21
2. https://www.javatpoint.com/data-science
3. https://www.coursera.org/browse/data-science /

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	3	2	2	-	-	-	-	-	-	-	2	1	2
2	2	2	2	1	1	-	-	-	-	-	-	-	2	1	2
3	2	1	3	2	3	-	-	-	-	-	-	-	2	1	2
4	1	2	2	1	1	-	-	-	-	-	-	-	-	1	2
5	2	1	1	2	1	-	-	1	-	-	-	-	-	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

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ANNEXURE - II

(Semester I to IV - Curriculum and Syllabi of R-2020)

SEMESTER – I

Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST101	Engineering Mathematics – I (Calculus and Linear Algebra)	BS	2	2	0	3	25	75	100
2	U20EST106	Introduction to Engineering: Distinction, Principles and Application	ES	3	0	0	3	25	75	100
3	U20EST107	Micro Electronics and Digital System Design	ES	2	2	0	3	25	75	100
4	U20EST109	Problem Solving Approach	ES	3	0	0	3	25	75	100
5	U20EST110	Programming in Python	ES	3	0	0	3	25	75	100
Practical										
6	U20ESP108	Micro Electronics and Digital System Design Laboratory	ES	0	0	2	1	50	50	100
7	U20ESP111	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
8	U20ESP112	Engineering Graphics Using AutoCAD Laboratory	ES	0	0	2	1	50	50	100
Employability Enhancement Course										
9	U20CSC1XX	Certification Course - I	EEC	0	0	4	-	100	-	100
Mandatory Course										
10	U20CSM101	Induction Program	MC	3 Weeks			-	-	-	-
							18	375	525	900

SEMESTER – II

Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST215	Engineering Mathematics – II (Multiple Integrals and Transforms)	BS	2	2	0	3	25	75	100
2	U20EST201	Programming in C	ES	3	0	0	3	25	75	100
3	U20CST201	Microprocessors and Microcontrollers	PC	3	0	0	3	25	75	100
4	U20CST202	Front-End Web Development	PC	3	0	0	3	25	75	100
5	U20CST203	Computer Organization and Architecture	PC	3	0	0	3	25	75	100
6	U20CST204	Computer Graphics	PC	3	0	0	3	25	75	100
Practical										
7	U20ESP202	Programming in C Laboratory	ES	0	0	2	1	50	50	100
8	U20CSP201	Microprocessors and Microcontrollers Laboratory	PC	0	0	2	1	50	50	100
9	U20CSP202	Front-End Web Development Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CSC2XX	Certification Course - II	EEC	0	0	4	-	100	-	100
11	U20CSS201	Skill Development Course 1*	EEC	0	0	2	-	100	-	100
Mandatory Course										
12	U20CSM202	Environmental Science	MC	2	0	0	-	100	-	100
							21	600	600	1200

**** Skill Development Courses (1, 2 and 3) are to be selected from the list given in Annexure IV***

SEMESTER – III

Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST322	Numerical Methods	BS	2	2	0	3	25	75	100
2	U20EST356	Data Structures	ES	3	0	0	3	25	75	100
3	U20EST359	Programming in C++	ES	3	0	0	3	25	75	100
4	U20CST305	Automata and Compiler Design	PC	2	2	0	3	25	75	100
5	U20CST306	Operating Systems	PC	3	0	0	3	25	75	100
6	U20CST307	Data Communications and Computer Networks	PC	3	0	0	3	25	75	100
Practical										
7	U20HSP301	General Proficiency - I	HS	0	0	2	1	50	50	100
8	U20BSP323	Numerical Methods Laboratory	BS	0	0	2	1	50	50	100
9	U20ESP357	Data Structures Laboratory	ES	0	0	2	1	50	50	100
10	U20ESP360	Programming in C++ Laboratory	ES	0	0	2	1	50	50	100
11	U20CSP303	Linux Internals Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
12	U20CSC3XX	Certification Course - III	EEC	0	0	4	-	100	-	100
13	U20CSS302	Skill Development Course 2*	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U20CSM303	Physical Education	MC	0	0	2	-	100	-	100
							23	700	700	1400

SEMESTER – IV

Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST432	Discrete Mathematics and Graph Theory	BS	2	2	0	3	25	75	100
2	U20EST467	Programming in JAVA	ES	3	0	0	3	25	75	100
3	U20CST408	Database Management Systems	PC	3	0	0	3	25	75	100
4	U20CST409	Design and Analysis of Algorithms	PC	2	2	0	3	25	75	100
5	U20CSE4XX	Professional Elective - I	PE	3	0	0	3	25	75	100
6	U20XXO4XX	Open Elective - I	OE	3	0	0	3	25	75	100
Practical										
7	U20HSP402	General Proficiency - II	HS	0	0	2	1	50	50	100
8	U20ESP468	Programming in JAVA Laboratory	ES	0	0	2	1	50	50	100
9	U20CSP404	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
10	U20CSP405	Design and Analysis of Algorithms Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CSC4XX	Certification Course - IV	EEC	0	0	4	-	100	-	100
12	U20CSS403	Skill Development Course 3*	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U20CSM404	NSS	MC	0	0	2	-	100	-	100
							22	650	650	1300

**** Skill Development Courses (1, 2 and 3) are to be selected from the list given in Annexure IV***

SEMESTER – V

Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST546	Probability and Statistics	BS	2	2	0	3	25	75	100
2	U20CST510	Handheld Computing: Design and Application Development	PC	3	0	0	3	25	75	100
3	U20CST511	Web Application Development	PC	3	0	0	3	25	75	100
4	U20CST512	Software Engineering and Testing	PC	3	0	0	3	25	75	100
5	U20CSE5XX	Professional Elective - II	PE	3	0	0	3	25	75	100
6	U20XXO5XX	Open Elective – II	OE	3	0	0	3	25	75	100
Practical										
7	U20CSP506	Handheld Computing Laboratory	PC	0	0	2	1	50	50	100
8	U20CSP507	Web Application Development Laboratory	PC	0	0	2	1	50	50	100
9	U20CSP508	Software Testing Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CSC5XX	Certification Course - V	EEC	0	0	4	-	100	-	100
11	U20CSS504	Skill Development Course 4: Foreign Language/ IELTS - I	EEC	0	0	2	-	100	-	100
12	U20CSS505	Skill Development Course 5: Presentation Skill using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U20CSM505	Indian Constitution	MC	2	0	0	-	100	-	100
							21	700	600	1300

SEMESTER – VI

Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20CST613	Artificial Intelligence and Expert Systems	PC	2	2	0	3	25	75	100
2	U20CST614	C# and .Net Programming	PC	3	0	0	3	25	75	100
3	U20CST615	Cloud Computing and Big Data	PC	3	0	0	3	25	75	100
4	U20CST616	Animation and Visual Effects	PC	3	0	0	3	25	75	100
5	U20CSE6XX	Professional Elective - III	PE	3	0	0	3	25	75	100
6	U20XXO6XX	Open Elective - III	HS	3	0	0	3	25	75	100
Practical										
7	U20CSP609	Artificial Intelligence and Expert Systems Laboratory	PC	0	0	2	1	50	50	100
8	U20CSP610	C# and .Net Programming Laboratory	PC	0	0	2	1	50	50	100
9	U20CSP611	Animation and Visual Effects Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CSC6XX	Certification Course - VI	EEC	0	0	4	-	100	-	100
11	U20CSS606	Skill Development Course 6: Foreign Language / IELTS - II	EEC	0	0	2	-	100	-	100
12	U20CSS607	Skill Development Course 7: Technical Seminar	EEC	0	0	2	-	100	-	100
13	U20CSS608	Skill Development Course 8: NPTEL / MOOC - I	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U20CSM606	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	800	600	1400

SEMESTER – VII										
Sl. No	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	U20CST717	IoT and Edge Computing	PC	3	0	0	3	25	75	100
2	U20CST718	Data Science and Digital Marketing Analytics	PC	3	0	0	3	25	75	100
3	U20CSE7XX	Professional Elective – IV	PE	3	0	0	3	25	75	100
4	U20XXO7XX	Open Elective – IV	OE	3	0	0	3	25	75	100
Practical										
5	U20HSP703	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
6	U20CSP712	IoT and Edge Computing Laboratory	PC	0	0	2	1	50	50	100
7	U20CSP713	Data Science and Digital Marketing Analytics Laboratory	PC	0	0	2	1	50	50	100
8	U20CSP714	Comprehensive Viva-Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U20CSW701	Project phase – I	PW	0	0	4	2	50	50	100
10	U20CSW702	Internship / Inplant Training	PW	0	0	0	2	100	-	100
Mandatory Course										
11	U20CSM707	Professional Ethics	MC	2	0	0	-	100	-	100
							20	600	500	1100

SEMESTER – VIII										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	U20CST819	Block chain and Cryptography	PC	3	0	0	3	25	75	100
2	U20CSE8XX	Professional Elective – V	PE	3	0	0	3	25	75	100
3	U20CSE8XX	Professional Elective – VI	PE	3	0	0	3	25	75	100
Practical										
4	U20HSP804	Entrepreneurship Management	HS	0	0	2	1	100	-	100
Project Work										
5	U20CSW803	Project phase – II	PW	0	0	16	8	40	60	100
Employability Enhancement Course										
6	U20CSS809	Skill Development Course 9: NPTEL / MOOC-II	EEC	0	0	0	-	100	-	100
							18	315	285	600

ANNEXURE - I
PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE401	Database Administration
2.	U20CSE402	E-Business
3.	U20CSE403	Object Oriented Analysis And Design
4.	U20CSE404	Scripting Languages
5.	U20CSE405	Fundamentals of Programming Languages
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE501	Enterprise Solutions
2.	U20CSE502	Game Development using Unity
3.	U20CSE503	Functional Programming
4.	U20CSE504	Robotics Process Automation
5.	U20CSE505	Software Project Management
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE601	Augmented Reality
2.	U20CSE602	Service Oriented Architecture
3.	U20CSE603	Agile Development
4.	U20CSE604	Embedded Systems
5.	U20CSE605	Assistive Technology
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE701	Network Security
2.	U20CSE702	Data Mining and Warehousing
3.	U20CSE703	Virtual Reality
4.	U20CSE704	Robotics
5.	U20CSE705	Haptic Computing
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE80	Ethical Hacking
2.	U20CSE81	Deep Learning
3.	U20CSE82	Mobile Computing
4.	U20CSE83	Pervasive Computing
5.	U20CSE84	Cyber Security and Digital Forensics
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U20CSE85	Quantum Computing
2.	U20CSE86	Trust Computing
3.	U20CSE87	Client Server Computing
4.	U20CSE88	Human Computer Interaction
5.	U20CSE89	Natural Language Processing

ANNEXURE - II

OPEN ELECTIVE COURSES (R-2020)

S.No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I (Offered in Semester IV)				
1	U20EEO401	Solar Photovoltaic Fundamental and applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE
2	U20EEO402	Electrical Safety	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT
3	U20ECO401	Engineering Computation with MATLAB	ECE	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics
4	U20ECO402	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT
5	U20CSO401	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U20CSO402	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U20ITO401	Database System: Design & Development	IT	EEE, ECE, ICE, CCE, BME
8	U20ITO402	R programming	IT	EEE, ECE, ICE, CCE, BME, MECH, Mechatronics
9	U20ICO401	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL, CCE, AI&DS, FT
10	U20ICO402	Control System Engineering	ICE	CSE, IT, MECH, CCE, AI&DS
11	U20MEO401	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME, FT
12	U20MEO402	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
13	U20MEO403	Industrial Engineering for Textile	MECH	FT
14	U20CEO401	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics, FT
15	U20CEO402	Building Science and Engineering	CIVIL	EEE, MECH, BME
16	U20BMO401	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS
17	U20BMO402	Telemedicine	BME	EEE, ECE, CSE, IT, ICE, CCE, AI&DS
18	U20CCO401	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
19	U20CCO402	Introduction to Communication Systems	CCE	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics
20	U20ADO401	Knowledge Representation and Reasoning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics

21	U20ADO402	Introduction to Data Science	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
Open Elective – II / Open Elective – III				
1	U20HSO501/ U20HSO601	Product Development and Design	MBA	**Common to B. Tech** (Offered in Semester V for **EEE, ECE, ICE, CIVIL, BME, CCE, FT**) (Offered in Semester VI for **CSE, IT, MECH, Mechatronics, AI&DS**)
2	U20HSO502/ U20HSO602	Intellectual Property and Rights	MBA	
3	U20HSO503/ U20HSO603	Marketing Management and Research	MBA	
4	U20HSO504/ U20HSO604	Project Management for Engineers	MBA	
5	U20HSO505/ U20HSO605	Finance for Engineers	MBA	
Open Elective – II / Open Elective – III (Offered in Semester V for **CSE, IT, MECH, Mechatronics, AI&DS**) (Offered in Semester VI for **EEE, ECE, ICE, CIVIL, BME, CCE, FT**)				
1	U20EEO503 / U20EEO603	Conventional and Non-Conventional Energy Sources	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics, CCE, AI&DS, FT
2	U20EEO504 / U20EEO604	Industrial Drives and Control	EEE	ECE, ICE, MECH, Mechatronics, AI&DS
3	U20ECO503/ U20ECO603	Electronic Product Design and Packaging	ECE	EEE, CSE, IT, ICE, MECH, CCE, BME, Mechatronics
4	U20ECO504/ U20ECO604	Automotive Electronics	ECE	EEE, ECE, ICE, MECH
5	U20CSO503/ U20CSO603	Platform Technology	CSE	EEE, ECE, ICE, MECH, CIVIL, BME
6	U20CSO504/ U20CSO604	Graphics Designing	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, FT
7	U20ITO503/ U20ITO603	Essentials of Data Science	IT	EEE, ECE, ICE, MECH, CIVIL, BME
8	U20ITO504/ U20ITO604	Mobile App Development	IT	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
9	U20ICO503/ U20ICO603	Fuzzy logic and neural networks	ICE	CSE, IT, CIVIL, BME, AI&DS
10	U20ICO504/ U20ICO604	Measurement and Instrumentation	ICE	ECE, Mechatronics
11	U20MEO504/ U20MEO604	Heating, ventilation and air conditioning system (HVAC)	MECH	EEE, ECE, ICE, CIVIL
12	U20MEO505/ U20MEO605	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME, Mechatronics
13	U20CEO503/ U20CEO603	Disaster Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
14	U20CEO504/ U20CEO604	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
15	U20BMO503/ U20BMO603	Biometric Systems	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics
16	U20BMO504/ U20BMO604	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, CIVIL , Mechatronics

17	U20CCO503/ U20CCO603	Network Essentials	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME
18	U20CCO504/ U20CCO604	Web Programming	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
19	U20ADO503/ U20ADO603	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE
20	U20ADO504/ U20ADO604	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
21	U20MCO501/ U20MCO601	Industrial Automation for Textile	Mechatronics	FT

Open Elective – IV (Offered in Semester VII)

1	U20EEO705	Hybrid and Electrical Vehicle	EEE	ECE, Mechatronics , MECH
2	U20EEO706	Electrical Energy Conservation and auditing	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics, CCE, AI&DS
3	U20ECO705	IoT and its Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, FT
4	U20ECO706	Cellular and Mobile Communications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
5	U20CSO705	Artificial Intelligence	CSE	EEE, ICE, CIVIL, CCE, MECH, FT
6	U20CSO706	Cloud Technology and its Applications	CSE	EEE, ICE, MECH, CIVIL, CCE, BME, Mechatronics
7	U20ITO705	Automation Techniques & Tools- DevOps	IT	EEE, ECE, ICE, CSE, MECH, CIVIL, CCE, BME, Mechatronics
8	U20ITO706	Augmented and Virtual Reality	IT	EEE, ICE, MECH, CIVIL, CCE, BME
9	U20ICO705	Process Automation	ICE	EEE, ECE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
10	U20ICO706	Virtual Instrumentation	ICE	EEE, ECE, MECH, Mechatronics
11	U20MEO706	Principles of Hydraulic and Pneumatic System	MECH	EEE, ECE, ICE, CIVIL
12	U20MEO707	Supply Chain Management	MECH	EEE, ECE, CIVIL, Mechatronics
13	U20CEO705	Energy Efficient Buildings	CIVIL	EEE, ECE, MECH
14	U20CEO706	Global Warming and Climate Change	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
15	U20MCO702	Building Automation	Mechatronics	MECH, CIVIL
16	U20MCO703	Automation in Manufacturing Systems	Mechatronics	MECH, CIVIL
17	U20BMO705	Internet of Things for Healthcare	BME	EEE, ECE, ICE, CCE

18	U20BMO706	Telehealth Technology	BME	EEE, ECE, ICE, CCE
19	U20CCO705	Data Science using python	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U20CCO706	Mobile Applications Development using Android	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
21	U20ADO705	Data Science Application of NLP	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics.
22	U20ADO706	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME
23	U20HSO706	Industrial Safety and Human Resource Management	MBA	FT
24	U20HSO707	Operation Research in Textile Industry	MBA	FT
25	U20HSO708	Global marketing and Sourcing Strategies	MBA	FT
26	U20HSO709	Fashion Advertising and sales promotions	MBA	FT
27	U20HSO710	Luxury Brand management	MBA	FT
28	U20HSO711	Fashion Retail Store Operations	MBA	FT

ANNEXURE - III

EMPLOYABILITY ENHANCEMENT COURSES-(A) CERTIFICATION COURSES

Sl. No.	Course Code	Course Title
1	U20CSCX01	3ds Max
2	U20CSCX02	Advance Structural Analysis of Building using ETABS
3	U20CSCX03	Advanced Java Programming
4	U20CSCX04	Advanced Python Programming
5	U20CSCX05	Analog System Lab Kit
6	U20CSCX06	Android Medical App Development
7	U20CSCX07	Android Programming
8	U20CSCX08	ANSYS -Multiphysics
9	U20CSCX09	Artificial Intelligence
10	U20CSCX10	Artificial Intelligence and Edge Computing
11	U20CSCX11	Artificial Intelligence in Medicines
12	U20CSCX12	AutoCAD for Architecture
13	U20CSCX13	AutoCAD for Civil
14	U20CSCX14	AutoCAD for Electrical
15	U20CSCX15	AutoCAD for Mechanical
16	U20CSCX16	Azure DevOps

17	U20CSCX17	Basic Course on ePLAN
18	U20CSCX18	Basic Electro Pneumatics
19	U20CSCX19	Basic Hydraulics
20	U20CSCX20	Bio Signal and Image Processing Development System
21	U20CSCX21	Blockchain
22	U20CSCX22	Bridge Analysis
23	U20CSCX23	Building Analysis and Construction Management
24	U20CSCX24	Building Design and Analysis Using AECO Sim Building Designer
25	U20CSCX25	CATIA
26	U20CSCX26	CCNA (Routing and Switching)
27	U20CSCX27	CCNA (Wireless)
28	U20CSCX28	Cloud Computing
29	U20CSCX29	Computer Programming for Medical Equipments
30	U20CSCX30	Corel Draw
31	U20CSCX31	Creo (Modeling and Simulation)
32	U20CSCX32	Cyber Security
33	U20CSCX33	Data Science and Data Analytics
34	U20CSCX34	Data Science using Python
35	U20CSCX35	Data Science using R
36	U20CSCX36	Deep Learning
37	U20CSCX37	Design and Documentation using ePLAN Electric P8
38	U20CSCX38	Design of Biomedical Devices and Systems
39	U20CSCX39	Digital Marketing
40	U20CSCX40	Digital Signal Processing Development System
41	U20CSCX41	DigSILENT Power Factory
42	U20CSCX42	Electro Hydraulic Automation with PLC
43	U20CSCX43	Embedded System using Arduino
44	U20CSCX44	Embedded System using C
45	U20CSCX45	Embedded System with IoT
46	U20CSCX46	ePLAN Data Portal
47	U20CSCX47	ePLAN Electric P8
48	U20CSCX48	ePLAN Fluid
49	U20CSCX49	ePLAN PPE
50	U20CSCX50	Fusion 360
51	U20CSCX51	Fuzzy Logic and Neural Networks
52	U20CSCX52	Google Analytics
53	U20CSCX53	Hydraulic Automation
54	U20CSCX54	Industrial Automation
55	U20CSCX55	Industry 4.0
56	U20CSCX56	Internet of Things
57	U20CSCX57	Introduction to C Programming
58	U20CSCX58	Introduction to C++ Programming
59	U20CSCX59	IoT using Python
60	U20CSCX60	Java Programming
61	U20CSCX61	Machine Learning
62	U20CSCX62	Machine Learning and Deep Learning
63	U20CSCX63	Machine Learning for Medical Diagnosis
64	U20CSCX64	Mechatronics

65	U20CSCX65	Medical Robotics
66	U20CSCX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
67	U20CSCX67	Mobile Edge Computing
68	U20CSCX68	Modeling and Visualization using Micro station
69	U20CSCX69	MX Road
70	U20CSCX70	Photoshop
71	U20CSCX71	PLC
72	U20CSCX72	Pneumatics Automation
73	U20CSCX73	Project Management
74	U20CSCX74	Python Programming
75	U20CSCX75	Revit Architecture
76	U20CSCX76	Revit Inventor
77	U20CSCX77	Revit MEP
78	U20CSCX78	Robotics
79	U20CSCX79	Search Engine Optimization
80	U20CSCX80	Software Testing
81	U20CSCX81	Solar and Smart Energy System with IoT
82	U20CSCX82	Solid Works
83	U20CSCX83	Solid Works with Electrical Schematics
84	U20CSCX84	Speech Processing
85	U20CSCX85	STAAD PRO V8i
86	U20CSCX86	Structural Design and Analysis using Bentley
87	U20CSCX87	Total Station
88	U20CSCX88	Video and Image Processing Development System
89	U20CSCX89	VLSI Design
90	U20CSCX90	Web Programming - I
91	U20CSCX91	Web Programming - II

ANNEXURE - IV

EMPLOYABILITY ENHANCEMENT COURSES - (B) SKILL DEVELOPMENT COURSES

Sl. No.	Course Code	Course Title
1.	U20CSS201	Skill Development Course 1 :Demonstration of Workshop Practices
2.	U20CSS302	Skill Development Course 2 *
		1) Computer Assembly and Troubleshooting
		2) Aptitude - I
		3) Electronic Devices and Circuits
3.	U20CSS403	Skill Development Course 3 *
		1) Exploring Photoshop
		2) Aptitude - II
		3) Office Automation
4.	U20CSS504	Skill Development Course 4 : Foreign Language/ IELTS -I
5.	U20CSS505	Skill Development Course 5 : Presentation Skills using ICT
6.	U20CSS606	Skill Development Course 6 : Foreign Language/ IELTS - II
7.	U20CSS607	Skill Development Course 7 : Technical Seminar

8.	U20CSS608	Skill Development Course 8 : NPTEL / MOOC - I
9.	U20CSS809	Skill Development Course 9 : NPTEL / MOOC-II

**** Any one course to be selected from the list***

SEMESTER I

		L	T	P	C	Hrs
U20BST101	**ENGINEERING MATHEMATICS – I** **CALCULUS AND LINEAR ALGEBRA**	**2**	**2**	**0**	**3**	**60**

(Common to all branches except CSBS)

Course Objectives

- To familiarize the concept of matrices.
- To introduce mathematical tools to solve first order differential equations.
- To learn linear differential equations of higher order with constant coefficients.
- To understand the concept of partial differentiation.
- To introduce the concepts of curl, divergence and integration of vectors in vector calculus.

Course Outcomes

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

CO1 – Understand the concept of Eigen values and Eigen vectors, Diagonalization of a matrix. **(K2)**
CO2 – Solve differential equations. **(K3)**
CO3 – Solve higher order differential equations. **(K3)**
CO4 – Solve different types of partial differential equation. **(K3)**
CO5 – Understand the use of vector calculus. **(K2)**

UNIT I MATRICES (12Hrs)

Rank of a Matrix – Consistency of system of equations. Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors. Cayley – Hamilton Theorem – Diagonalization of matrices.

UNIT II DIFFERENTIAL EQUATIONS (12 Hrs)

Exact equations, First order linear equations, Bernoulli's equation, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT III DIFFERENTIAL EQUATIONS (HIGHER ORDER) (12 Hrs)

Linear differential equations of higher order with constant coefficients, the operator D,
Euler's linear equation of higher order with variable coefficients, Solution by variation of parameter method.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS (12 Hrs)

Partial derivatives, Total derivatives, Differentiation of implicit functions, Maxima and Minima of two variables. Partial differential equations of higher order with constant coefficients.

UNIT V VECTOR CALCULUS (12 Hrs)

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Gauss Divergence Theorem and Stokes Theorem.

Text books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley, 10th Edition, 2019.
2. B.V.Ramana,"Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6th Edition 2018.
3. N.P. Bali and Manish Goyal,"A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, 9th Edition, 2018.

Reference books

1. C W. Evans, "Engineering Mathematics", A Programmed Approach, 3rd Edition, 2019.
2. Dr. A. Singaravelu, "Engineering Mathematics - I", Meenakshi publications, Tamil Nadu, 2019.
3. M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, Madras, 2016.
4. S. Narayanan and Manicavachagom T.K. Pillay," Differential Equations and Its Applications", Paperback, Viswanathan.S, Printers & Publishers Pvt Ltd , 2009.
5. Dr. G Balaji, "Engineering Mathematics – I", G. Balaji publishers, 2017.

Web References

1. http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra –slides-Systemsofquation-handout.pdf
2. http://www.math.cum.edu/~wn0g/2ch6a.pdf
3. https://nptel.ac.in/courses/122/104/122104017/
4. https://nptel.ac.in/courses/111/106/111106051/
5. https://nptel.ac.in/courses/111/108/111108081/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	1	-	-	-	-	1	3	2	1
2	3	2	1	1	-	1	1	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	1	-	-	-	-	1	3	2	1
4	3	2	1	1	-	1	1	-	-	-	-	1	3	2	1
5	2	1	-	-	-	-	1	-	-	-	-	1	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20EST106	**INTRODUCTION TO ENGINEERING: DISTINCTION, PRINCIPLES AND APPLICATION**	3	0	0	3	45

(Common to CSE,IT,CCE).

Course Objectives

- To understand the basics of Engineering Disciplines and Design concepts.
- To understand the various strategies used in solution design.
- To understand about the testing, product evaluation and report writing.
- To know about the project management skills ethics in project development.
- To understand about ethics in project development.

Course Outcomes

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

CO1 - Explain technological & engineering development, change and impacts of engineering. **(K2)**
CO2 - Infer problem, list criteria and constraints, brainstorm potential solutions and document the ideas. **(K2)**
CO3 - Exemplify possible solutions through drawings, testing and prepare project report. **(K3)**
CO4 - Use project management skills and ethics in doing projects. **(K3)**
CO5 - Employ ethics in engineering. **(K3)**

UNIT I INTRODUCTION TO ENGINEERING **(9 Hrs)**

Engineering: Engineering Defined – Careers in Engineering Fields – Engineering Disciplines. Engineering as a Profession: Functions of Engineers – Teamwork – Engineering Profession – Engineering Impacts – Future of Engineering. Engineering Design: Engineering Design – Engineering Design Process – Engineering Notebooks.

UNIT II PROBLEMS AND BRAINSTORMING **(9 Hrs)**

Defining Problems and Brainstorming: Defining the Problem – Brainstorming – Initial Outcomes Researching Designs: Sketches – Researching Ideas – Trade-offs – Selecting the Best Approach.

UNIT III COMMUNICATION SOLUTONS **(9 Hrs)**

Communication Solutions: Engineering Drawings – Working Drawings – Drawing Classifications – Drawing Guidelines and Industry Guidelines. Modeling – Testing and Final Outputs: Modeling – Testing – Predictive Analysis – Testing – Engineering Economics – Final Outputs – Design Improvement – Final Project Report.

UNIT IV PROJECT MANAGEMENT **(9 Hrs)**

Project Management: Introduction to Agile Practices – Significance of team work – Importance of communication in engineering profession – Project Management tools: Checklist – Timeline – Gantt Chart – Significance of Documentation.

UNIT V ENGINEERING ETHICS **(9 Hrs)**

Engineering Ethics: Introduction to ethics – Identifying engineering as a profession – Code of conduct for Engineers – Risk – Safety and Accidents – Rights and Responsibilities of Engineers – Ethical Issues in Engineering Practice.

Text Books

1. Ryan A.Brown, Joshua W.Brown and Michael Berkihiser: "Engineering Fundamentals: Design, Principles, and Careers", Goodheart-Willcox Publisher, Second Edition, 2018.
2. Charles D.Fleddermann, "Engineering Ethics", Pearson,education, Fourth Edition, 2014.
3. Saeed Moaveni, "Engineering Fundamentals: An Introduction to Engineering", Cengage learning, Fourth Edition, 2011.

Reference Books

1. Mike W. Martin, Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2005

Web References

1. https://nptel.ac.in/courses/110106124/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	3	-	-
2	2	1	-	-	-	-	-	-	-	-	-	-	3	-	-
3	2	1	-	-	-	-	-	-	-	3	-	-	3	-	-
4	3	2	1	1	-	-	-	-	-	-	3	-	3	-	-
5	3	2	1	1	-	-	-	3	-	-	-	-	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20EST107	MICROELECTRONICS AND DIGITAL SYSTEM DESIGN	L	T	P	C	Hrs
		2	2	0	3	60

(Common to CSE and IT)

Course Objectives

- To understand the theory of diodes and applications.
- To acquire an in-depth knowledge and apply the characteristics of transistors in realizing them as basic building blocks of logic gates.
- To Gain knowledge on Boolean algebra and various simplifications of Boolean functions.
- To acquire the ability to develop any combinational logic functions and design combinational circuit.
- To understand the behavior of sequential circuits.

Course Outcomes

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

CO1 - Explain various diodes and interpret its applications. **(K2)**
CO2 - Demonstrate and Experiment the transistors and its types. **(K3)**
CO3 - Review the knowledge of Number systems and simplifications of Boolean functions. **(K2)**
CO4 - Understand and experiment the various combinational logic circuits. **(K3)**
CO5 - Understand and experiment the various sequential circuits. **(K3)**

UNIT I SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES (12 Hrs)

Introduction to Semiconductor Materials – Doping-Intrinsic and Extrinsic Semiconductor – PN junction diode, structure, VI characteristics – Diffusion and Depletion capacitance – Rectifier, Half wave and Full wave rectifier – Zener Diode – Reverse Characteristic of a Zener Diode – Light Emitting Diode (LED) – Liquid Crystals Displays (LCD) – Photo Diodes.

UNIT II TRANSISTORS AND APPLICATIONS (12 Hrs)

Introduction to BJT – Construction of BJT – BJT Circuit configurations: CB, CE, CC – Current Gain of a BJT in CB, CE, CC – Transistors as switch, Amplifier and Buffer – Logic gates using transistors – Operational Amplifiers – Inverting and Non-Inverting Op-Amps – Voltage follower – Summing amplifiers and Differential amplifiers.

UNIT III REVIEW OF NUMBER SYSTEMS (12 Hrs)

Review of Number systems – Conversion of Number systems – Binary addition and subtractions – Binary representation: Signed magnitude representation and Compliment representations – Binary codes – Boolean Algebra – Boolean functions – Canonical forms – Simplifications of Boolean function: Theorems and laws, Karnaugh Map and Quine McCluskey method.

UNIT IV COMBINATIONAL LOGIC DESIGN (12 Hrs)

Introduction to combinational circuits – Design procedures of Combinational circuits – Adders – Subtractors – Binary parallel Adder – BCD Adder – Carry look ahead adder – Decoder – Encoder – Priority Encoder – Multiplexer – Design and Implementations of combinational circuits using Multiplexer – Demultiplexer – Parity Generator and checker.

UNIT V SEQUENTIAL LOGIC DESIGN (12 Hrs)

Introduction to Sequential Circuits – Latches – Types of Latches: SR Latch and D Latch – Flip-Flop – Types of Flip-Flops: RS, JK, D, T Flip-Flops – Excitation table of Flip-Flops – Counters: Asynchronous Counters – Synchronous counters – MOD counters – Shift registers – Types of Shift registers: SISO, SIPO, PISO, PIPO and Universal Shift registers – Ripple counter and Johnson counter.

Text Books

1. M. Morris Mano and Michael Ciletti, "Digital Design", Pearson India Education Services, Sixth Edition, 2018.
2. J. Millman, C. Halkias and Satyabrata, "Electronic Devices and Circuits", McGraw Hill, Third Edition, 2010.
3. R.S.Sedha, "Applied Electronics", S.Chand & Company Ltd., Third Edition, 2008.

Reference Books

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, Eleventh Edition, 2015.
2. Thomas L. Floyd, "Electronic Devices", Pearson Education, Ninth Edition, 2012.
3. Adel. S. Sedra, Kenneth C. Smith, "Micro Electronic circuits", Oxford University Press, Sixth Edition, 2010.
4. David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford Press, Fifth Edition, 2009.
5. Thomas L. Floyd, "Digital Fundamentals", Pearson Education, Tenth Edition, 2009.

Web References

1. https://nptel.ac.in/courses/117106114/
2. https://nptel.ac.in/courses/117106086/
3. http://www.electronics-tutorials.ws
4. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	3	1	1
2	3	2	1	1	-	-	-	-	-	-	-	-	3	1	1
3	2	1	-	-	-	-	-	-	-	-	-	-	3	1	1
4	2	1	-	-	-	-	-	-	-	-	-	-	3	1	1
5	2	1	-	-	-	-	-	-	-	-	-	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20EST109	PROBLEM SOLVING APPROACH	L	T	P	C	Hrs
	(Common to CSE, IT and CCE)	3	0	0	3	45

Course Objectives

- To identify the key concepts of computational thinking and problem solving.
- To know the basics of algorithm and data organization.
- To understand the fundamental algorithms and factoring methods.
- To know the basic concepts of array and problem solving techniques.
- To familiarize the concepts of text processing, pattern searching and recursive algorithms.

Course Outcomes

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

CO1 - Explain the basic concepts of computational thinking and problem solving. **(K2)**
CO2 - Explain basic concepts of algorithm and data organization. **(K2)**
CO3 - Illustrate algorithmic solution to problem solving. **(K3)**
CO4 - Explain the concepts of array, merging, sorting & searching. **(K2)**
CO5 - Implement recursive algorithm to solve problems. **(K3)**

UNIT I INTRODUCTION (9 Hrs)

Computational Thinking - Information and Data - Converting Information into Data – Data Capacity – Data Types and Encoding – Logic-Solving Problems – Limits of Computation – Pseudocode and Flow Chart.

UNIT II ALGORITHMIC THINKING & DATA ORGANIZATION (9 Hrs)

Algorithmic Thinking: Algorithms – Software and Programming Languages – Actions. Data Organization: Name list, Graph Hierarchies – Spread Sheets – Text processing – Patterns – Pseudocode and Flow Chart.

UNIT III FUNDAMENTAL ALGORITHMS & FACTORING METHODS (9 Hrs)

Fundamental Algorithms: Exchanging – Counting – Summing – Factorial Computation – Fibonacci Sequence – Reversing the Digit-Base Conversion – Character to number conversion. Factoring Methods: Finding Square Root – Greatest Common Divisor – Prime Number – Prime Factor – Pseudocode and Flow Chart.

UNIT IV ARRAY, MERGING, SORTING AND SEARCHING (9 Hrs)

Array Techniques: Introduction – Array order reversal – Array Counting or Histogramming – Maximum and Minimum of a Set – Removal of Duplicate – Partitioning – Longest monotone. Sorting and searching: Sorting by Bubble, Selection, Insertion. Searching: Linear, Binary – Pseudocode and Flow Chart.

UNIT V TEXT PROCESSING, PATTERN SEARCHING & RECURSIVE ALGORITHM (9 Hrs)

Key word Searching – Text Line Adjustment – Linear Pattern Search – Sub Linear Pattern Search. Recursion: Towers of Hanoi – Sample Generation – Combination Generation – Permutation Generation – Pseudocode and Flow Chart.

Text Books

1. David Riley and Kenny Hunt, "Computational Thinking for Modern Problem Solver", Chapman & Hall / CRC Textbooks in Computing, 2014.
2. R. G.Dromey, "How to solve it by Computer", PHI, 2008.
3. Vickers Paul, "How to Think like a Programmer: Problem Solving for the Bewildered", Cengage Learning EMEA, 2008.

Reference Books

1. Kathryn Rentz, Paula Lentz, "A Problem-solving Approach ", McGraw-Hill Education, 2018.
2. Don McAdam, Roger Winn," A Problem-Solving Approach", Prentice Hall Canada; 2nd Edition, 2017.
3. V. Anton Spraul, "Think Like a Programmer: An Introduction to Creative Problem Solving", Cengage Learning EMEA, 2012.
4. Sham Tickoo "A Problem-solving Approach", Delmar / Çengage Learning, 2009.
5. Harold Abelson & Gerald Jay Sussman, "Structure and Interpretation of Computer Programs", McGraw-Hill Book Company, 1997.

Web References

1. https://www.edx.org/learn/problem-solving
2. https://www.lynda.com/Business-Skills-tutorials/Problem-Solving-Techniques/553700-2.html
3. https://www.classcentral.com/course/problem-solving-skills-6687

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	1	-	-	-	1	-	-	1	3	2	3
2	2	1	-	-	1	-	-	-	-	-	-	1	3	2	3
3	2	1	-	-	1	-	-	-	-	-	-	1	3	2	3
4	2	1	-	-	1	-	-	-	-	-	-	1	3	2	3
5	3	2	1	1	1	-	-	-	-	-	-	1	3	2	3

U20EST110

PROGRAMMING IN PYTHON

(Common to CSE, IT, CCE,FT)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To acquire programming skill in core python.
- To learn the basic Syntax and Semantics of Python Programming.
- To learn how to design python program and applications.
- To acquire object oriented skills in python.
- To develop the skill of designing applications using modules and packages

Course Outcomes

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

CO1 - Define the structure and components of a python program. **(K1)**
CO2 - Illustrate the concepts of Python decision statements. **(K2)**
CO3 - Interpret the use of loops and functions to facilitate code reuse. **(K3)**
CO4 - Use list, tuple, Set and dictionary in python program. **(K3)**
CO5 - Read / write data from/to files and structure a program using Except ions and Modules. **(K3)**

UNIT I INTRODUCTION TO PYTHON PROGRAMMING LANGUAGE (9 Hrs)

Introduction to Python Language – Strengths and Weaknesses – IDLE – Visual Source Code – Arithmetic Operators – Arithmetic Expressions – Dynamic Types – Naming Conventions – String Values – String Operations – String Slices – String Operators – Numeric Data Types – Conversions

UNIT II DECISION MAKING (9 Hrs)

Control Flow: Introduction – Control Flow and Syntax – Indenting – Relational Operators – Relational Expressions – Logical – Operators – Logical Expressions – If Statement – If else – Elif – Nested if.

UNIT III LOOPING (9 Hrs)

Loop: The while Loop – Break and continue – Nested while Loop – For Loop – Nested for Loop. Functions: parameters – Return values – Local and global scope – Function composition – Recursion and lambda functions.

UNIT IV LIST, TUPLE, SET, DICTIONARY, ARRAYS (9 Hrs)

Lists: List operations – List slices – List methods – List loop – Mutability – Aliasing – Cloning lists – List parameters – Tuples: Tuple assignment – Tuple as return value – Advanced list processing – List comprehension – Sets – Dictionaries: Operations and methods – Arrays.

UNIT V FILES, EXCEPTIONS, MODULES, AND PACKAGES (9 Hrs)

Built In Functions. Files and Exception: Text Files – Reading and writing files – Format operator – Command line arguments – Errors and exceptions – Handling exceptions – Modules – Standard modules – Packages – Bit Wise Operators.

Text Books

1. Martin C Brown, "Python The Complete Reference", McGraw-Hill Education, 4th Edition, 2018
2. Reema Thareja, "Python Programming Using Problem Solving Approach", ISBN: 9780199480173, Oxford University Press, First edition, 2017
3. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Shroff/O'Reilly Publishers, 2nd edition, 2016 (http://greenteapress.com/wp/thinkpython/).

Reference Books

1. Robert Sedgewick, "Kevin Wayne, Robert Dondero – Introduction to Programming inPython: An Inter-disciplinary Approach", Pearson India Education Services Pvt. 2016.
2. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
3. Ben Stephenson, "The Python Workbook A Brief Introduction with Exercises and Solutions", Springer International Publishing, Switzerland 2014.
4. John V Guttag, "Introduction to Computation and Programming Using Python", MIT Press, Revised and expanded Edition, 2013.
5. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.

Web References

1. https://www.learnpython.org/
2. https://pythonprogramming.net/introduction-learn-python-3-tutorials/
3. https://www.codecademy.com/learn/learn-python
4. https://nptel.ac.in/courses/106/106/106106182/

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	1	-	-	-	-	-	-	-	3	1	3
2	2	1	-	-	1	-	-	-	-	-	-	-	3	1	3
3	2	1	-	-	1	-	-	-	-	-	-	-	3	1	3
4	3	2	1	1	1	-	-	-	-	-	-	-	3	1	3
5	3	2	1	1	1	-	-	-	-	-	-	-	3	1	3

		L	T	P	C	Hrs
U20ESP108	**MICROELECTRONICS AND DIGITAL SYSTEM DESIGN LABORATORY**	**0**	**0**	**2**	**1**	**30**

(Common to CSE and IT)

Course Objectives

- To provide the basic operation and applications of electronic devices.
- To design and implementations of the digital combinational circuits.
- To develop the circuit for amplifier.
- To design and implementations of the digital sequential circuits.
- To design and implement various kinds of registers.

Course Outcomes

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

CO1 - Familiar about electronic components and able to apply in rectifier and amplifiers circuits. **(K3)**
CO2 - Analyze and construct the combinational logic circuits. **(K3)**
CO3 - Analyze and construct the sequential logic circuits. **(K3)**
CO4 - Illustrate the use of Flip-Flops. **(K3)**
CO5 - Experiment shift registers and counters. **(K3)**

List of Exercises

1. Verification of Kirchhoff's Laws and Network Theorems.(Hardware and simulation)
2. Characteristics of PN junction diode and Half and Full wave Rectifier.
3. Characteristics of Zener diode, design and implementation of Zener diode voltage regulator
4. Characteristics of BJT
5. Characteristics of FET
6. Frequency Response of RC Coupled Amplifiers
7. Simplification of Boolean expression using Karnaugh map and Quine McCluskey Methods
8. Design and Implementation of adder and subtractor using logic gates
9. Design and Implementation of code converters
10. Design and Implementation of 3 bit odd/even parity generator/checker
11. Design and Implementation of Multiplexer and De-multiplexer Circuits
12. Design and Implementation of Encoders and Decoders
13. Study of Flip-flops
14. Design and implementations of shift registers.
15. Design and Implementation of 4 bit counters.

Reference Books

1. M. Morris Mano, "Digital Design", Pearson Education, 6th Edition, 2017.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education Eleventh Edition, 2015.
3. J. Millman, C. Halkias and Satyabrata, Electronic devices and Circuits, Third Edition, McGraw Hill, 2010.
4. David A Bell, "Fundamentals of Electronic Devices and Circuits", Fifth edition Oxford Press, 2009.
5. Thomas L. Floyd, "Digital Fundamentals", Tenth Edition, Pearson Education, New Delhi, 2009.

Web References

1. https://nptel.ac.in/courses/117106114/
2. https://nptel.ac.in/courses/117106086/
3. http://www.electronics-tutorials.ws
4. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1

U20ESP111

PROGRAMMING IN PYTHON LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

(Common to CSE, IT, CCE,FT)

Course Objectives

- To acquire programming skill in core python.
- To learn how to design python program and applications.
- To acquire object oriented skills in python.
- To design and implement modules and packages.
- To develop the skill of designing applications.

Course Outcomes

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

CO1 - Examine Python syntax and semantics. **(K3)**

CO2 - Demonstrate proficiency in handling Strings and File Systems. **(K3)**

CO3 - Compile, run and manipulate Python Programs using core data structures. **(K3)**

CO4 - Interpret the concepts of Object-Oriented Programming as used in Python. **(K3)**

CO5 - Implement exemplary applications related to modules and packages in Python. **(K3)**

List of Exercises

1. Develop simple programs using python syntax and semantics.
2. Demonstrate python program using Arithmetic expressions.
3. Demonstrate python program using Strings.
4. Demonstrate python program using relational expressions.
5. Understand the decision making statement.
6. Illustrate Conditional statements with real time problems.
7. Write Python Functions to facilitate code reuse.
8. Basic python applications using List, Tuples, Sets.
9. Implementation of searching.
10. Implementation of sorting.
11. Implement python programs using Dictionaries
12. Illustrate file concepts with real time problems
13. Use Exception handling in python applications for error handling.
14. Implement simple applications using Modules
15. Implement simple applications using Packages
16. Develop Real time application like Number guessing, Dice rolling simulator, Mobile contacts, etc

Reference Books

1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press; First edition, 2017.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt., 2016.
3. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Ben Stephenson, "The Python Workbook A Brief Introduction with Exercises and Solutions", Springer International Publishing, 2014.
5. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Pragmatic Programmers, LLC, Second edition, 2013.

Web References

1. https://nptel.ac.in/courses/106/106/106106182/
2. https://www.learnpython.org/
3. https://pythonprogramming.net/introduction-learn-python-3-tutorials/
4. https://www.codecademy.com/learn/learn-python

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	1

U20ESP112	ENGINEERING GRAPHICS USING AUTO CAD	L	T	P	C	Hrs
	(Common to ECE, IT, CSE, ICE, MECH, BME,CSBS,Mechatronics)	0	0	2	1	30

Course Objectives

- To develop graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to standardized technical drawings
- To extend the skill to use software for creating 2D and 3D models
- To draw a simple steel truss.
- To develop the isometric projection of simple objects.

Course Outcomes

After completion of the course, the student will be able to:

CO1 - Familiarize with the fundamentals and standards of engineering graphics. **(K2)**

CO2 - Perform freehand sketching of basic geometrical constructions and multiple views of objects. **(K3)**

CO3 - Visualize the project isometric and perspective sections of simple solids and to be familiar on software packages for drafting and modelling. **(K3)**

CO4 - Connect side view associate on front view.**(K4)**

CO5 - Correlate sectional views of prism, pyramid, cylinder and cone. **(K4)**

List of Exercises

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and Dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3D models of simple objects and obtaining 2D multi-view drawings from 3Dmodel.

Note: Plotting of drawings must be made for each exercise and attached to the records written by Students.

Reference Books

1. James D. Bethune, "Engineering Graphics with AutoCAD 2020 (A Spectrum book), Macromedia Press, Pearson, 1st Edition, 2020.
2. Bhatt N.D and Panchal V.M, "Engineering Drawing: Plane and Solid Geometry", Charotar Publishing House, 2017.
3. Jeyapoovan T, "Engineering Drawing and Graphics Using AutoCAD", Vikas Publishing, 7th Edition, 2016.
4. Dhananjay A. Jolhe, "Engineering Drawing: With an Introduction To CAD", McGraw Hill, 2016.
5. James Leach, "AutoCAD 2017 Instructor", SDC Publications, 2016.
6. NS Parthasarathy and Vela Murali, "Engineering Drawing", Oxford university press, 2015.
7. M.B Shah, "Engineering Graphics", ITL Education Solutions Limited, Pearson Education Publication, 2011.

Web References

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php
2. http://www.nptelvideos.in/2012/12/computer-aided-design.html
3. https://mech.iitm.ac.in/meiitm/course/cad-in-manufacturing/
4. https://autocadtutorials.com
5. https://dwgmodels.com

CO/PO/PSO Mapping

COs	Program Outcomes												Program Specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-
2	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-
3	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-
4	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-
5	3	1	-	-	3	-	-	-	3	-	-	3	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSC1XX	CERTIFICATION COURSES	L	T	P	C	Hrs
		0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

U20CSM101

INDUCTION PROGRAM

Induction program for students to be offered right at the start of the first year

Duration of the Program	3 Weeks
Induction program	• Physical Activity • Creative Arts and Culture • Mentoring & Universal Human Values • Familiarization with College, Dept./Branch • Literary Activity • Proficiency Modules • Lectures & Workshops by Eminent People • Visits in Local Area • Extra-Curricular Activities in College

1. Physical Activity

This would involve a daily routine of physical activity with games and sports. There would be games in the evening or at other suitable times according to the local climate. These would help develop team work besides health. Each student could pick one game and learn it for the duration of the induction program and hopefully, continue with it later.

2. Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, music, dance, pottery, sculpture etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

3. Mentoring and Universal Human Values

Mentoring and connecting the students with faculty members is the most important part of student induction. Mentoring takes place in the context and setting of Universal Human Values. It gets the student to explore oneself and experience the joy of learning, prepares one to stand up to peer pressure and take decisions with courage, be aware of relationships and be sensitive to others, understand the role of money in life and experience the feeling of prosperity. Need for character building has been underlined by many thinkers, universal human values provide the base. Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but by getting the students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values. The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program. Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

4. Other Activity

Activities that are not there on a daily basis, but are conducted for 3-4 days (typically in the afternoons) and change thereafter.

4.1. Familiarization with College, Department/Branch

The incoming students should be told about the credit and grading system, and about the examinations. They should be informed about how study in college differs from study in school. They should also be taken on a tour of the college and shown important points such as library, canteen, and other facilities. They should be shown their department, and told what it means to get into the branch or department. Describe what role the technology related to their department plays in society, and after graduation what role the student would play in society as an engineer in that branch. A lecture by an alumnus of the Dept. would be very helpful in this regard. They should also be shown the laboratories, workshops and other facilities. The above should be done right in the first two days, and then over the afternoons thereafter, as appropriate.

4.2. Literary Activity

Literary activity would encompass reading a book, writing a summary, debating, enacting a play etc.

4.3. Proficiency Modules

The induction program period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

4.4. Lectures & Workshops by Eminent People

Lectures by eminent people should be organized, say, once a week. It would give the students exposure to people who are eminent, in industry or engineering, in social service, or in public life. Alumni could be invited as well. Motivational lectures about life, meditation, etc. by Ramakrishna Mission, Art of Living, Vivekanand Kendras, S-VYASA, etc. may be organized. Workshops which rejuvenate or bring relief to students would also be welcome, such as, Art of Living workshops (3 sessions, 9 hours).

4.5. Visits in Local Area

A couple of visits to the local landmarks including historical monuments should be organized. This would familiarize the students with the area together with bonding with each other, like in a picnic. Visits should also be organized to a hospital, orphanage or a village. These would expose them to people in suffering or to different lifestyles. This might also sensitize them to engineering needs in these areas.

4.6. Extra-Curricular Activities in College

The new students should be introduced to the extra-curricular activities at the college/university. They should be shown the facilities and informed about activities related to different clubs etc. This is when selected senior students involved in or leading these activities can give presentations, under faculty supervision.

SEMESTER II

U20BST215

ENGINEERING MATHEMATICS II
MULTIPLE INTEGRALS AND TRANSFORMS

(Common to all branches except CSBS)

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

- To develop logical thinking and analytic skills in evaluating multiple integrals.
- To equip themselves familiar with Laplace, transform and solve the differential equations using Laplace transform techniques.
- To enable the students to expand functions into Fourier series using change of intervals.
- To gain good knowledge in application of Fourier transform.
- To inculcate the computational knowledge in Z-transforms.

Course Outcomes

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

CO1 – Understand the concept of double and triple integrals. **(K2)**
CO2 – Apply Laplace transform and inverse Laplace transform of simple functions. **(K3)**
CO3 – Convert a periodic function into series form. **(K3)**
CO4 – Compute Fourier transforms of various functions. **(K3)**
CO5 – Solve difference equations using Z – transforms. **(K3)**

UNIT I MULTIPLE INTEGRALS (12 Hrs)

Multiple Integrals, change of order of integration and change of variables in double integrals (Cartesian to polar). Applications: Areas by double integration and volumes by triple integration (Cartesian and polar).

UNIT II LAPLACE TRANSFORMS AND INVERSE LAPLACE TRANSFORMS (12 Hrs)

Definition, Transforms of elementary functions, properties. Transform of derivatives and integrals. Multiplication by t and division by t. Transform of unit step function, transform of periodic functions. Initial and final value theorems, Methods for determining inverse Laplace Transforms, Convolution theorem, Application to differential equations and integral equations. Evaluation of integrals by Laplace transforms.

UNIT III FOURIER SERIES (12 Hrs)

Dirichlet's conditions – General Fourier series – Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems.

UNIT IV FOURIER TRANSFORMS (12 Hrs)

Fourier Integral theorem Fourier transform and its inverse, properties. Fourier sine and cosine transforms their properties, Convolution and Parseval's identity.

UNIT V Z – TRANSFORMS (12 Hrs)

Difference equations, basic definition, z – transform - definition, Standard z – transforms, Damping rule, Shifting rule, Initial value and final value theorems and problems, Inverse z – transform. Applications of z – transforms to solve difference equations.

Text Books

1. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", Tata McGraw Hill, 1st Edition, New Delhi, 2016.
2. P. Sivaramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearsons, New Delhi, 2017.
3. M.D.Petale, "A text book on Z- Transforms (Engineering Mathematics)", Bames and Noble, New Edition, 2020.

Reference Books

1. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Co. New Delhi, 2019.
2. N.P. Bali and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2015.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition 2019.
4. C. B. Gupta, Shree Ram Singh, M. Kumar, "Engineering Mathematics for semester I & II", Tata McGraw Hill, New Delhi, 2016.
5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi 2018.

Web References

1. https://nptel.ac.in/courses/111105121/
2. https://nptel.ac.in/courses/111105035/
3. https://nptel.ac.in/courses/111107119/
4. https://swayam.gov.in/nd1_noc20_ma17/preview
5. https://nptel.ac.in/courses/111/103/111103021/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	1	1	2	1
2	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
5	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20EST201

PROGRAMMING IN C

L	T	P	C	Hrs
3	0	0	3	45

(Common to CSE, ECE, EEE, IT, ICE, MECH,
CIVIL,BME,MECHTRONICS, CCE)

Course Objectives

- To understand the Fundamentals of Computers and introduction to C language.
- To study about the programs using Control structures
- To understand the programs using looping and arrays
- To understand the concepts of Functions and Pointers.
- To study about Structure, Union and File Management Operations in C.

Course Outcomes

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

CO1 - Comprehend the basic constructs of C programming. **(K2)**

CO2 - Illustrate the concepts of sequential, selection and repetition control structures in C program. **(K2)**

CO3 - Implement simple programs using looping structure and arrays. **(K3)**

CO4 - Demonstrate programs using Functions and Pointers. **(K3)**

CO5 - Build programs using Structure, Union and understand the concept of File management Operations. **(K3)**

UNIT I INTRODUCTION TO C (9 Hrs)

C programming: Overview of C – Visual Studio code-Constants – Compiling a C Program – Variables and Data Types – Technical Difference between Keywords and Identifiers – Types of C Qualifiers and format specifies – Operators and Expressions – Operators Precedence – Type conversion – Input-Output Statements.

UNIT II DECISION MAKING (9 Hrs)

Decision Making and Branching – Relational operators – Logical operators – If – If else – If else If – Nested if. Switch-case.

UNIT III LOOPING AND ARRAYS (9 Hrs)

Looping: while - do while – for – break – continue - nested loop Arrays: One Dimensional Arrays-Two-Dimensional Arrays-Multi-Dimensional Array-Dynamic arrays-Character Arrays and String-Sorting - Searching.

UNIT IV FUNCTIONS, POINTERS (9 Hrs)

Functions: Introduction - Definition – Declaration – Categories of Functions - Nesting of Functions, Recursive functions - Passing Arrays to Functions - Strings – String library function. Pointers: Introduction - Declaring Pointer Variables - Initialization of Pointer Variables - Accessing the address of a variable - Accessing a variable thorough Pointer - Chain of Pointers - Pointer Expressions - Pointers and arrays – Pointers and functions – Call by Reference - Pointers and character strings - Array of Pointers - Pointers and Structures.

UNIT V STRUCTURES AND UNIONS, FILE MANAGEMENT (9 Hrs)

User defined data types: Introduction – Structure: definition - declaration - Arrays of Structures – Nested structures – Passing structures to functions — Union - Enumeration and Typedef. Introduction to File Handling in C, Input and Output operations on a file – Error Handling - Random access to files – command line arguments. Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives.

Text Books

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 8th Edition, 2019.
2. Yashvant Kanetkar, "Let us C", BPB Publications, 16th Edition, 2017.
3. Herbert Schildt," C: The Complete Reference", McGraw Hill, Fourth Edition, 2014.

Reference Books

1. Dr. P. Rizwan Ahmed, "Office Automation", Margham Publications, 2016.
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2012.
3. Vikas Verma, "A Workbook on C ", Cengage Learning, Second Edition, 2012.
4. P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", Fourth Edition, Sri Krishna Publications, 2012.
5. Pradip Dev, Manas Ghoush, "Programming in C", Second Edition, Oxford University Press, 2011.

Web References

1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c-language-set-1-introduction/
3. https://www.tutorialspoint.com/cprogramming
4. https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c
5. https://nptel.ac.in/courses/106/104/106104128/

COs/POs/PSOs Mapping (CSE)

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CST201	**MICROPROCESSORS AND MICROCONTROLLERS**	3	0	0	3	45

(Common to CSE and IT)

Course Objectives

- To understand and learn the architecture and assembly language program of 8085.
- To understand and learn the architecture and assembly language program of 8086.
- To explore the interfacing the peripherals and other chips to 8086
- To learn and understand the Intel 8051 microcontroller architecture.
- To acquire the knowledge of Raspberry Pi and Arduino Processors.

Course Outcomes

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

CO1 - Explain the basic architecture of 8085 microprocessors **(K2)**

CO2 - Articulate the knowledge of the architecture and instruction sets of 8086 **(K2)**

CO3 - Summarize the interfacing of various peripherals to various 8086. **(K2)**

CO4 - Illustrate the architecture of the 8051 microcontrollers **(K2)**

CO5 - Exemplify the use of Raspberry and Arduino processors. **(K2)**

UNIT I INTEL 8085 MICROPROCESSORS (9 Hrs)

Introduction – Need for Microprocessor – Evolution – 8085 Architecture – Pin diagram - Timing Diagram – Addressing Modes – Instruction Formats – Instruction Set.

UNIT II INTEL 8086 MICROPROCESSORS (9 Hrs)

Introduction to 8086 Microprocessor – 8086 Architecture – Pin diagram – I/O & Memory Interfacing – Addressing Modes – Instruction Format – Instruction Set – Interrupts – Assembler Directives – Assembly Language Programming.

UNIT III PERIPHERALS & INTERFACING TO 8086 (9 Hrs)

Parallel Communication Interface (8255) – Serial Communication interface (8251) – D/A and A/D Interface – Programmable Timer Controller (8254) – Keyboard/display controller (8279) – Programmable Interrupt Controller (8259) – DMA controller (8237).

UNIT IV INTEL 8051 MICROCONTROLLER AND INTERFACING (9 Hrs)

Introduction – Architecture – Memory Organization – Special Function Registers – Pins and Signals – Timing and control – Port Operation – Memory and I/O Interfacing – Interrupts – Instruction Set and Programming. Interfacing – LCD & Keyboard Interfacing – RTC and EEPROM interface using I2C protocol – Stepper Motor, Traffic Light Controller.

UNIT V INTRODUCTION TO RASPBERRY PI and ARDUINO (9 Hrs)

Raspberry Pi Hardware – Raspberry Pi Software – Programming on Raspberry Pi – Interfacing to Raspberry Pi Inputs/ Outputs – Interfacing to Raspberry Pi Buses – Interacting to Physical Environment. – Arduino Board – Sketches – Mathematical Operators – Serial Communications – Interfacing with sensors.

Text Books

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design", Prentice Hall of India, Second Edition, 2015.
2. Ramesh S. Gaonkar, "Microprocessor - Architecture, Programming and Applications with 8085", Penram International Publications, Sixth Edition, 2013.
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson education, Second Edition, 2011.

Reference Books

1. Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry", Wiley, Second Edition, 2019.
2. Rithard blum,Christile Bresnahan, "Programming with Raspberry Pi: Getting Started with Python", Second Edition, Packet Publisher, 2016.
3. Derek Molloy, "Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux", Wiley, 1st Edition, 2016.
4. Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and system Design 8085, 8086, 8051, 8096", PHI, 2014.
5. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012.

Web References

1. https://swayam.gov.in/nd1_noc20_ee42/microprocessors-and-microcontrollers/
2. https://www.classcentral.com/course/swayam
3. https://freevideolectures.com/course/3018/microprocessors
4. https://www.arduino.cc/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	3	2	2
2	2	1	-	-	-	-	-	-	-	-	-	-	3	2	2
3	2	1	-	-	3	-	-	-	-	-	-	-	3	2	2
4	2	1	-	-	3	-	-	-	-	-	-	-	3	2	2
5	2	1	-	-	3	-	-	-	-	-	-	-	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CST202	**FRONT-END WEB DEVELOPMENT**	3	0	0	3	45

(Common to CSE and IT)

Course Objectives

- To demonstrate competency in the use of common HTML code.
- To understand how CSS will affect web page creation.
- To know about how grid work and how to use them in mobile and responsive design in bootstrap
- To understand the role of JavaScript in web page creation
- To develop basic programming skills using jQuery.

Course Outcomes

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

CO1 - Articulate HTML tags and elements. **(K2)**
CO2 - Demonstrate and display website elements. **(K3)**
CO3 - Build responsive websites to fit into large and small screens. **(K3)**
CO4 - Implement client side programming using JavaScript. **(K3)**
CO5 - Use jQuery concepts on website creation. **(K3)**

UNIT I HTML 5 (9 Hrs)

HTML Introduction: Visual Studio Code – Basic – Elements – Attributes – Headings – Paragraphs – Styles – Formatting – Comments – Colors – CSS – Links – Images – Tables – Lists – Block & Inline – Classes – Id – Iframes – JavaScript – File Paths – Head – Computer code. HTML Forms: Form Elements – Input Types – Input Attributes – Input Form Attributes. HTML Graphics: Canvas – SVG – Video – Audio.

UNIT II CSS 3 (9 Hrs)

Introduction CSS3: Syntax – Selectors – Inline / Internal / External, Comments – Colors – Backgrounds – Borders – Margins – Padding –Height/Width – Box Model – Outline – Text – Fonts – Icons – Links – Lists – Tables – Display – Float – Inline-block – Align – Opacity – Navigation Bar – Dropdowns – Image Gallery – Forms. CSS Advanced: Rounded Corners – Backgrounds – Colors – Gradients – Shadows – Text Effects – Transitions – Animations – Style Images – Buttons – Flexbox. Grid: Container – Grid Item.

UNIT III BOOTSTRAP 4 (9 Hrs)

Bootstrap 4: – Get Started – Containers – Grid Basic – Typography – Colors – Tables – Images – Jumbotron – Alerts - Buttons – Button Groups – Badges – Progress Bars – Spinners – Pagination – List Groups –Cards – Dropdowns – Collapse – Navs – Navbar – Forms – Inputs – Input Groups – Custom Forms – Carousel – Modal – Tooltip – Popover – Toast – Scrollspy – Flex – Icons – Media Objects – Filters

UNIT IV JAVASCRIPT (9 Hrs)

JavaScript Program: Introduction – Output – Statements – Syntax – Comments – Variables – Operators – Arithmetic – Data Types – Functions – Objects – Events – Strings – String Methods – Numbers – Number Methods – Arrays – Array Methods – Array Sort – Dates – Math – Booleans – Comparisons – Conditions – Loop For – Loop While – Break – JSON – Popup Alert. JavaScript Objects: Object Definitions – Object Properties – Object Methods – Object Display. JavaScript DOM: Intro – Methods – Document – Elements – HTML – CSS – Animations – Events – Event Listener – Navigation – Nodes – Collections – Node Lists.

UNIT V JQUERY (9 Hrs)

jQuery Introduction: Syntax – Selectors – Events. JQuery Effects: Hide/Show – Fade – Slide – Animate – stop()– Callback – Chaining. JQuery HTML: Get/Set – Add – Remove – CSS Classes – Dimensions. JQuery Traversing: Ancestors – Descendants – Siblings – Filtering. JQuery AJAX: Load – Get/Post – Filters.

Text Books

1. Randy Connolly, "Fundamentals of Web Development", Paperback, First Edition, 2015.
2. Jon Dukett, "JavaScript and JQuery: Interactive Front–End Web Development", Paperback,2014.
3. Deital & Deital, "Internet and World Wide Web-How to Program", Pearson Education, Fifth Edition, 2012.

Reference Books

1. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dreamtech Press, 1st edition, 2018.
2. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS & Javascript Web", BPB Publications, First edition, 2016.
3. Robert W. Sebasta, "Programming the World Wide Web", Pearson Education, 8th Edition, 2015.
4. Bassett, Lindsay, "Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, 2015.
5. Simon Collison, "Beginning CSS Web Development", Apress, 2nd edition, 2006.

Web References

1. https://www.w3schools.com/html/default.asp
2. https://www.w3schools.com/css/default.asp
3. https://www.w3schools.com/bootstrap4/default.asp
4. https://www.w3schools.com/js/default.asp
5. https://www.w3schools.com/jquery/default.asp

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	2	-	-	-	-	-	-	-	-	1	2
2	3	2	1	1	2	-	-	-	-	-	-	-	-	1	2
3	3	2	1	1	2	-	-	-	-	-	-	-	-	1	2
4	3	2	1	1	2	-	-	-	-	-	-	-	-	1	2
5	3	2	1	1	2	-	-	-	-	-	-	-	-	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST203	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C	Hrs
		3	0	0	3	45

(Common to CSE and IT)

Course Objectives

- To understand the basic structure and operation of a digital computer
- To learn the fundamentals of organizational and architectural aspects of control unit
- To acquire knowledge about processor and memory design of a digital computer
- To have a broad understanding of various system interfaces and Input output devices
- To obtain knowledge on recent processors.

Course Outcomes

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

CO1 - Identify and explain the basic structure of a computer and instruction sets with addressing modes and discuss the design of ALU. **(K1)**

CO2 - Identify the mechanism in Hardwired control and micro programmed control unit along with concepts of pipelining and applications. **(K1)**

CO3 - Illustrate the memory mapping procedure to enhance the performance of the system. **(K2)**

CO4 - Discuss the standard I/O interfaces and peripheral devices. **(K2)**

CO5 - Outline the advanced concepts of multi-core processors and modern Processors. **(K2)**

UNIT I BASIC COMPUTER ORGANIZATION AND DESIGN (9 Hrs)

Block Diagram of Computer-Instruction Codes – Computer Registers – Instruction Cycle – Memory reference Instructions – Input – Output and Interrupt Design of Basic Computer – ALU design.

UNIT II BASIC PROCESSING UNIT (9 Hrs)

Fundamental concepts-Execution of a complete instruction – Multiple bus organization – Hardwired control – Microprogrammed control – Pipelining: Basic concepts – Data hazards-Instruction hazards – Influence on Instruction sets – Data path and control consideration – Super Scalar Processors, VLIW, Parallel and Vector Processors.

UNIT III MEMORY ORGANIZATION (9 Hrs)

Memory hierarchy – main memory – Memory chip Organization- auxiliary memory – Associate memory – Virtual memory – Cache memory – Cache algorithms, Cache Hierarchy, Cache coherence protocols, Performance, Interleaving, On chip Vs Off chip Memories / Caches.

UNIT IV INPUT-OUTPUT ORGANIZATION (9 Hrs)

Input-output interface – asynchronous data transfer – modes of transfer – priority interrupt – DMA –Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB)

UNIT V ADVANCED PROCESSOR ARCHITECTURE (9 Hrs)

Parallel processing and its challenges- Instruction level parallelism – Flynn's classification – Hardware multithreading: SISD, MIMD, SIMD, SPMD and Vector multithreading – Multicore processors: Shared memory multiprocessor and cluster multiprocessor.

Text Books

1. Carl Hamacher, Zvonko G. Vranesic, Safwat G. Zaky, "Computer Organization", McGraw-Hill, 5th edition, 2014
2. David A. Patterson and John L. Henessey, "Computer Organisation and Design", Morgan Kauffman / Elseveir, Fifth edition, 2014.
3. Morris Mano, "Computer System Architecture ", Prentice Hall of India, Third Edition, 2008.

Reference Books

1. William Stallings, "Computer Organization and Architecture", Prentice-Hall of India, 7th Edition, 2016.
2. John P.Hayes, "Computer Architecture and Organisation", McGraw Hill, 2012.
3. Morris Mano, "Computer System Architecture ", Prentice Hall of India, Third Edition, 2008.
4. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Pearson Education, Second Edition, 2005.
5. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", Tata McGraw Hill, First edition, 2005.

Web References

1. http://www.inetdaemon.com/tutorials/computers/hardware/cpu/
2. https://inst.eecs.berkeley.edu/~cs152/sp18/
3. http://users.ece.cmu.edu/~jhoe/doku/doku.php?id=18-447_introduction_to_computer_architecture

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-
2	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-
3	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-
4	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-
5	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST204 COMPUTER GRAPHICS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To learn the primitives and clipping methods and to explore object construction using primitives.
- To apply transformations and texture on the object.
- To design the 3D geometric transformations.
- To learn and perform modeling
- To acquire the knowledge of advance rendering.

Course Outcomes

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

CO1 – Develop the line, circle and ellipse drawing algorithms. **(K3)**
CO2 – Apply the two dimensional geometric transformations. **(K3)**
CO3 – Apply the three dimensional geometric transformations. **(K3)**
CO4 – Work with color models such as RGN, YIQ, CMY and HSV. **(K3)**
CO5 – Apply different methods for image rendering. **(K3)**

UNIT I INTRODUCTION TO COMPUTER GRAPHICS (9 Hrs)

Introduction – Applications- Graphics Systems – Output Primitives – Representing Image – Straight Line – Line Drawing Algorithms – DDA Algorithms – Bresenhams' Line Algorithms – Circle Algorithms – Bresenhams' Circle Algorithm – Midpoint Circle Algorithm – Ellipse Generating Algorithm – Midpoint Ellipse Algorithm.

UNIT II TWO DIMENSIONAL TRANSFORMATIONS (9 Hrs)

Introduction – Representation of points – Matrix Algebra and Transformation – Transformation of points – Straight lines – Midpoint Transformation – Transformation of parallel lines – Intersecting lines – Rotation – Reflection and scaling of straight lines – Combined Transformations – Translation and Homogeneous Coordinates – Rotation about Arbitrary point – Reflection about Arbitrary line – Windowing and clipping.

UNIT III THREE DIMENSIONAL TRANSFORMATION (9 Hrs)

Introduction – 3D Transformation – Rotation about an axis parallel to coordinate Axis– Reflection about an arbitrary axis in space – Reflection through an arbitrary plane – 3D modeling schemes – Projection – Orthographic – Isometric – oblique – perspective – 3D clipping.

UNIT IV COLOR AND ILLUMINATION MODELS (9 Hrs)

Introduction – colors – Illumination model and light sources – Specular Reflection – Intensity Attenuation – Shadow - Reflectivity and refractivity – Radiosity Model – Texturing – Surface – Bump mapping – Environment Mapping – Shading Methods

UNIT V MODELLING CONCEPTS AND TECHNIQUES (9 Hrs)

Introduction – structures and Hierarchical Modeling – Advanced Modeling Techniques – Procedural Models – Fractals - Grammar based Models – Physical based Modeling – Animation – Devices – Computer assisted – video formats – Frame by Frame animation – Real Time Animation Techniques

Text Books

1. Amarendra N Sinha, Arun D Udai, "Computer Graphics", Tata Mc-Graw Hill ,First Edition, 2008.
2. D Hearn and P M Baker ,"Computer Graphics", Prentice Hall of India Second Edition,2008.
3. Foley, van Dam, Feiner and Hughes ,"Computer Graphics Principles and Practice", Addison Wesley, First Edition, 2004.

Reference Books

1. Foley, Vandam, Feiner, Huges, "Computer Graphics Principles", Pearson Education, 2nd Edition, 2013.
2. Hill, "Computer Graphics using Open GL", Pearson Education, 2007.
3. F .S. Hill, "Computer Graphics using OPENGL", Pearson Education, Second edition 2003.
4. Elsom Cook- "Principles of Interactive Multimedia", McGraw Hill, 2001.
5. Z. Xiang, R. Plastock Schaum's, " Outlines Computer Graphics", TMH, 2nd Edition, 2000.

Web References

1. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-837-computer-Graphics-fall-2003/
2. http://www.moshplant.com/direct-or/bezier/
3. http://www.cs.mtu.edu/~shene/COURSES/cs3621/NOTES/spline/B-spline/bspline-curve-rop.html
4. https://nptel.ac.in/courses/106/106/106106090/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	-	-	1	-	-	-	-	-	-	2	1	2
2	3	2	2	1	-	1	-	-	-	-	-	-	1	3	1
3	3	2	-	-	-	2	-	-	-	-	-	-	1	2	1
4	-	2	-	3	-	-	-	-	-	-	-	-	3	3	-
5	3	2	1	-	-	2	-	-	-	-	-	-	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20ESP202	PROGRAMMING IN C LABORATORY (Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL,BME,MECHTRONICS, CCE)	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To practice the fundamental programming methodologies in the C programming language.
- To apply logical skills for problem solving using control structures and arrays.
- To design, implement, test and debug programs that use different data types, variables, strings, arrays, pointers and structures.
- To design modular programming and provide recursive solution to problems.
- To understand the miscellaneous aspects of C and comprehension of file operations.

Course Outcomes

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

CO1 - Implement logical formulations to solve simple problems leading to specific applications. **(K3)**

CO2 - Execute C programs for simple applications making use of basic constructs, arrays and strings. **(K3)**

CO3 - Experiment C programs involving functions, recursion, pointers, and structures. **(K3)**

CO4 - Demonstrate applications using sequential and random access file processing. **(K3)**

CO5 - Build solutions for online coding challenges. **(K3)**

List of Exercises

1. Simple programming exercises to familiarize the basic C language constructs.
2. Develop programs using identifiers and operators.
3. Develop programs using decision-making and looping constructs.
4. Develop programs using functions as mathematical functions.
5. Develop programs with user defined functions – includes parameter passing.
6. Develop program for one dimensional and two dimensional arrays.
7. Develop program for sorting and searching elements.
8. Develop program to illustrate pointers.
9. Develop program with arrays and pointers.
10. Develop program for dynamic memory allocation.
11. Develop programs for file operations.

Reference Books

1. Zed A Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley, 2016.
2. Anita Goel and Ajay Mittal, "Computer Fundamentals and programming in C", Pearson Education, First edition, 2011.
3. Maureen Sprankle,Jim Hubbard," Problem Solving and Programming Concepts," Pearson, 9th Edition, 2011.
4. Yashwanth Kanethkar, "Let us C", BPB Publications, 13th Edition, 2008.
5. B.W.Kernighan and D.M. Ritchie, "The C Programming Language", Pearson Education, 2nd Edition, 2006.

Web References

1. https://alison.com/course/introduction-to-c-programming
2. https://www.geeksforgeeks.org/c-programming-language/
3. http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf
4. https://www.tenouk.com/clabworksheet/clabworksheet.html
5. https://fresh2refresh.com/c-programming/

COs/POs/PSOs Mapping (CSE)

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSP201	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	L	T	P	C	Hrs
	(Common to CSE and IT)	0	0	2	1	30

Course Objectives

- To write assembly language programs using 8085 trainer kit.
- To be familiar with MASM-8086.
- To write basic assembly language programs using 8051 trainer kit.
- To develop simple application using Raspberry pi.
- To build simple systems with Arduino.

Course Outcomes

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

CO1 - Demonstrate simple programs and design interfacing circuits with 8085. **(K3)**

CO2 - Implement assembly language program using MASM. **(K3)**

CO3 - Execute programs in 8051 microcontroller. **(K3)**

CO4 - Build simple applications using Raspberry pi **(K3)**

CO5 - Employ Arduino in simple applications **(K3)**

List of Exercises

1. Simple programming exercises on 8085.
2. Simple programming exercises on 8086.
3. Code conversions.
4. String Manipulation – Search, find and replace, copy operations, sorting and searching.
5. Interfacing with 8086 – Programmable peripherals interface (8255) and Programmable Interval Timer (8253).
6. Interfacing with 8086 - Serial communication Interface (8251).
7. 16 bit Arithmetic operations using 8051.
8. Interfacing stepper motor with 8086/8051.
9. Interfacing ADC and DAC with 8086/8051.
10. Interfacing traffic light controller with 8086/8051.
11. Implementation and design of IoT Cloud - Getting Started using Arduino
12. Implementation and design of Temperature Monitoring With DHT22 &Arduino
13. Implementation and design of PIR Motion Sensor with Raspberry Pi
14. Implementation and design of Raspberry Pi DS18B20 Temperature sensor
15. Implementation and design of Light Control Using Arduino, Raspberry Pi

Reference Books

1. Michael Margolis, "Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects", O'Reilly Media, 3rd Edition, 2020.
2. Derek Molloy, "Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux", Wiley 1st Edition, 2016.
3. Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2014.
4. Ramesh S.Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", Penram International publishing, 2013.
5. A.K. Ray, K.M. Bhurchandi, "Advanced Microprocessor and Peripherals", Tata McGraw-hill, Second edition, 2010.

Web References

1. https://nptel.ac.in/courses/108/103/108103157/
2. https://www.geeksforgeeks.org/microprocessor-tutorials/
3. https://www.arduino.cc/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSP202	**FRONT - END WEB DEVELOPMENT LABORATORY**	0	0	2	1	30

(Common to CSE and IT)

Course Objectives

- To demonstrate competency in the use of common HTML code.
- To understand how CSS will affect web page creation.
- To know how grid work and how to use them in mobile and responsive design in bootstrap
- To understand the role of JavaScript in web page creation
- To develop basic programming skills using jQuery.

Course Outcomes

After completion of the course, the students will be able to **CO1** - Construct websites with HTML tags and elements. **(K3)**

CO2 - Demonstrate and display website elements. **(K3)**

CO3 - Build Responsive website to fit into large and small screens. **(K3)**

CO4 - Implement client side programming using JavaScript **(K3)**

CO5 - Use jQuery concepts on website creation. **(K3)**

List of Exercises

1. HTML: Tags, Links, Images,
2. HTML: tables, list
3. HTML: Forms
4. HTML: Video, Audio
5. Create your address and basic details using HTML
6. CSS: selectors,Inline / Internal / External
7. CSS: Colour
8. CSS: Margin and Padding
9. CSS: Box Model,Fonts
10. CSS: Tables
11. CSS: Display - Float - Inline-block
12. CSS: Align- Opacity
13. CSS: Navigation Bar - Dropdowns - Image Gallery – Forms
14. CSS: Transitions – Animations
15. CSS: Flexbox – Grid
16. Create your resume using HTML & CSS
17. Bootstrap: Containers - Grid Basic – Jumbotron
18. Bootstrap: Buttons - Cards – Navbar
19. Bootstrap: Forms - Inputs - Input Groups
20. Bootstrap: Carousel - Modal – Filters.
21. Create a business page of your parents using Bootstrap page
22. JavaScript: Output - Statements - Variables - Operators - Arithmetic – Functions
23. JavaScript: Objects - Events - Strings - String Methods - Numbers - Number Methods - Arrays – Array Methods.
24. JavaScript: Dates - Math - Booleans - Comparisons - Conditions - Loop For - Loop While - Break - JSON.
25. JavaScript: Object Definitions - Object Properties - Object Methods - Object Display.
26. JavaScript DOM: Methods - Document - Elements - HTML - CSS - Animations - Events - Event Listener
27. Find total, result and class of your marks using JavaScript
28. jQuery: Selectors - Events.
29. jQuery: Effects: Hide/Show - Fade - Slide.
30. jQuery: HTML: Get/Set - Add - Remove

Reference Books

1. Robert W. Sebasta, "Programming the World Wide Web", Pearson Education, 8th Edition, 2015.
2. Bassett, Lindsay, "Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, 2015.
3. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS & Javascript Web", BPB Publications, First edition, 2016.
4. Simon Collison ,"Beginning CSS Web Development", Apress, 2nd Edition, 2006.
5. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dreamtech Press, 1st Edition, 2018.

Web References

1. https://www.w3schools.com/html/default.asp
2. https://www.w3schools.com/css/default.asp
3. https://www.w3schools.com/bootstrap4/default.asp
4. https://www.w3schools.com/js/default.asp
5. https://www.w3schools.com/jquery/default.asp

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2
2	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2
3	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2
4	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2
5	3	2	1	1	3	-	-	-	-	-	-	-	-	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSC2XX	**CERTIFICATION COURSES**	0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

		L	T	P	C	Hrs
U20CSS201	**DEMONSTRATION OF WORKSHOP PRACTICES** (Common to ECE, CSE, IT, ICE, MECH, BME)	0	0	2	0	30

Course Objectives

- To have practical exposure to various welding and joining processes.
- To impart skill in fabricating simple components using sheet metal
- To train the students in metal joining processes like soldering in PCB.
- To understand the working procedure of various Conventional Machines.
- To cultivate safety aspects in handling of tools and equipment.

Course Outcomes

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

CO1 - Identify different prototypes in the carpentry trade such as lap joint, Butt joint. **(K1)**

CO2 - Classify the fabrication of simple sheet metal parts. **(K2)**

CO3 - Interpret the casting preparation. **(K2)**

CO4 - Identify the conventional machine operations. **(K1)**

CO5 - Describe the skills, and modern engineering tools necessary for engineering practice. **(K1)**

DEMONSTRATION OF EXPERIMENTS

1. Welding Exercises
    a. Introduction to BI Standards and reading of welding drawings.
    b. Butt Joint
    c. Lap Joint
    d. Arc Welding
    e. Gas Welding
2. Sheet Metal Exercises
    a. Making of Cube
    b. Making of Cone using development of surface
3. Casting
    a. Green Sand Moulding preparation
4. Demonstration of Conventional Machines.
5. Bosch Tools Demonstration
    a. Demonstration of all Bosch tools.

Reference Books

1. K.C. John, "Mechanical Workshop Practice", PHI Learning Private Limited, 2010
2. KA Navas, "Electronics Lab Manual", Fifth edition, PHI Learning Private Limited, 2015
3. S K Hajra, Choudhary and A K Chaoudhary, Workshop Technology I,II,III, by. Media Promoters and Publishers Pvt. Ltd., Bombay
4. T Jeyapoovan, Basic Workshop Practice Manual, Vikas Publishing House (P) Ltd.,New Delhi
5. K Venkata Reddy, KL Narayana, Manual on Workshop Practice, MacMillan India Ltd.

Web References

1. https://www.weld.com/
2. https://welding.com/
3. https://sciencing.com/soldering-desoldering-techniques-8288017.html
4. https://nptel.ac.in/courses/112/107/112107084/
5. https://nptel.ac.in/courses/112/106/112106153/

COs Mapping with POs and PSOs

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1
2	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1
3	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1
4	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1
5	3	1	-	-	3	-	-	-	3	-	-	3	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSM202	ENVIRONMENTAL SCIENCE	L	T	P	C	Hrs
		0	0	3	1	30

Course Objectives

- To study the basic concepts of ecosystem and biodiversity.
- To provide knowledge on the various aspects of different types of pollution such as air pollution, water pollution, soil pollution etc.
- To study the interrelationship between living organism and environment.
- To give a basic knowledge on the social issues such as air, water and wildlife.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

Course Outcomes

After completion of the course, the students will able to

CO1 - Understand the core concepts of ecological system and biodiversity with their importance on environment.
CO2 - Knowledge on the different types of pollution will help the young minds to device effective control measures to reduce rate of pollution.
CO3 - Know about the various natural resources available, their importance and methods of conservation.
CO4 - Know about the social issues faced due to unhealthy environmental situation and roles/responsibilities of organizations taking care.
CO5 - Get awareness on the population growth and impact on environment. Ethics and role of an individual in safe guarding the environment.

UNIT I ECOSYSTEM AND BIODIVERSITY **(6 Hrs)**

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids. Introduction to biodiversity definition: genetic, species and ecosystem diversity – bio-geographical classification of India - India as a mega diversity nation. Endangered and endemic species of India. Conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION **(6 Hrs)**

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. Nuclear hazards – Soil waste Management: Causes, effects and control measures of urban and industrial wastes –Disaster management: floods, earthquake, cyclone and landslides.

UNIT III NATURAL RESOURCES **(6 Hrs)**

Forest resources: Use and over exploitation, deforestation, case studies- timber extraction, mining and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT **(6 Hrs)**

From unsustainable to sustainable development Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people-its problems and concerns - Environmental ethics: issues and possible solutions Environment protection Act - Air (prevention and control of pollution) Act - Water (prevention and control of pollution) Act - Wildlife protection act - Forest conservation act - Issues involved in enforcement of environmental legislations - Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT **(6 Hrs)**

Population growth, variation among nations – Population explosion – Family Welfare Programme – Environment and human health – Human Rights – Value Education – HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and human health-health - role of an individual in conservation of natural resources.

Text Books

1. Miller T.G. Jr., "Environmental Science", Cengage, 14th Edition, 2014
2. Townsend C., Harper J and Michael Begon, "Essentials of Ecology", John Wiley and Sons, 4th Edition. 2014.
3. Gilbert M. Masters and Wendell P. Ela , "Introduction to Environmental Engineering and Science", 3rd Edition, Pearson, 2007.

Reference Books

1. ErachBharucha,"Textbook of Environmental studies", UGC, 2017.
2. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India, 2014.
3. Cunningham W.P. and Cunningham M.A. (2002), "Principles of Environmental Science", Tata McGraw-Hill Publishing Company, 2008.

Web References

1. www.iucn.org
2. www.cites.org
3. www.rainwaterharvesting.org/happenings/wetland_conservation.htm
4. www.thesummitbali.com/
5. http://moef.gov.in/
6. www.water-pollution.org.uk/eutrophication.html
7. www.environengg.com/
8. www.wastewatertreatment.co.in/

COs Mapping with POs and PSOs

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	3	1	3	3	3	1	2	1	3	-	-	1
2	2	3	2	3	1	3	3	3	1	2	1	3	-	-	1
3	3	3	3	3	3	3	3	3	2	2	2	3	-	-	1
4	3	3	3	3	3	3	3	3	2	2	2	3	-	-	1
5	3	3	3	3	3	3	3	3	2	2	2	3	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

SEMESTER III

U20BST322

NUMERICAL METHODS

(Common to CSE, IT & BME)

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

- To know the solution of algebraic and transcendental equations.
- To learn the techniques of solving simultaneous equations.
- To introduce the numerical techniques of differentiation and integration.
- To solve ordinary differential equations by using numerical methods.
- To know the solution of partial differential equations by using numerical methods.

Course Outcomes

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

CO1 – Use Numerical techniques to solve algebraic and transcendental equations. **(K2)**
CO2 – Find the solution of simultaneous equations. **(K2)**
CO3 – Apply the knowledge of differentiation and integration by using numerical methods. **(K3)**
CO4 – Solve the ordinary differential equations by using various methods. **(K3)**
CO5 – Solve the partial differential equations by numerical methods. **(K3)**

UNIT I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS AND EIGEN VALUE PROBLEMS

(12Hrs)

Bisection method – Method of false position – Newton Raphson method – Eigen value and Eigen vector by power method.

UNIT II LINEAR SIMULTANEOUS EQUATIONS

(12 Hrs)

Solution of linear simultaneous equations and matrix inversion – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.

UNIT III INTERPOLATION

(12 Hrs)

Interpolation: Finite Differences – Relation between operators – Interpolation by Newton's forward and backward difference formula for equal intervals – Newton's divided difference method and Lagrange's method for unequal intervals – Differentiation based on finite differences – Integrations by Trapezoidal and Simpson's rules.

UNIT IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

(12 Hrs)

Single step methods – Taylor series method – Picard's method – Euler and Improved Euler methods – Runge Kutta method of fourth order only.

UNIT V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS

(12 Hrs)

Solution of Laplace and Poisson equations – Leibmann's iterative method – Diffusion equation: Bender-Schmitt method and Crank-Nicholson implicit difference method – Wave equation: Explicit difference method

Text Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., 7th Edition, 2019.

Reference Books

1. C. Xavier, "C Language And Numerical Methods", New Age International, 2007.
2. P. Siva Ramakrishna Das, "Numerical Analysis", Kindle Edition, 2016.
3. Timo Heister, Leo G. Rebholz, Fei Xue, "Numerical Analysis an Introduction", Publisher De Gruyter, 2019.
4. K. Sankara Rao, "Numerical Methods for Scientists and Engineers", PHI Learning Pvt.Ltd, New Delhi, 3rd Edition, 2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

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3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	-	-	-	-	-	1	3	2	1
2	2	1	-	-	-	1	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
5	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20EST356 DATA STRUCTURES

L	T	P	C	Hrs
3	0	0	3	45

(Common to ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS,CCE)

Course Objectives

- To impart the basic concepts of data structures and its terminologies.
- To understand concepts about stack and queue operations.
- To understand basic concepts about linked list and its various operations.
- To understand concepts about Tree and its applications.
- To understand basic concepts about Sorting, Hashing and Graph.

Course Outcomes

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

CO1 - Compute time and space complexity for given problems **(K3)**
CO2 - Demonstrate stack, queue and its operation. **(K3)**
CO3 - Illustrate the various operations of linked list. **(K3)**
CO4 - Use the concepts of tree for various applications. **(K3)**
CO5 - Outline the various sorting, hashing and graph techniques. **(K3)**

UNIT I BASIC TERMINOLOGIES OF DATA STRUCTURES (9 Hrs)

Introduction: Basic Terminologies – Elementary Data Organizations. Data Structure Operations: Insertion – Deletion – Traversal. Analysis of an Algorithm. Asymptotic Notations. Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques – Complexity analysis.

UNIT II STACK AND QUEUE OPERATIONS (9 Hrs)

Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.

UNIT III LINKED LIST OPERATIONS (9 Hrs)

Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.

UNIT IV TREES (9 Hrs)

Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree. Introduction to B-Tree and B+ Tree.

UNIT V SORTING, HASHING AND GRAPHS (9 Hrs)

Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table – Hash Function and its characteristics. Graph: Basic Terminologies and Representations – Graph traversal algorithms.

Text Books

1. Ellis Horowitz, Sartaj Sahni,"Fundamentals of Data Structures", Computer Science Press, Second Edition, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. Balagurusamy, "Data Structures", Tata McGraw-Hill Education, 2019.
2. D.Samanta, "Classic Data Structures, Prentice-Hall of India, Second Edition, 2012.
3. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c", Prentice-Hall of India, Second Edition, 2007.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition, 2006.
5. Mark Allen Weiss, "Algorithms, Data Structures and Problem Solving with C++", Addison-Wesley Publishing Company, Illustrated Edition, 1995.

Web References

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial/
3. https://www.studytonight.com/data-structures/
4. https://www.tutorialspoint.com/data_structures_algorithms/
5. https://www.w3schools.in/data-structures-tutorial/intro/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20EST359	PROGRAMMING IN C++	L	T	P	C	Hrs
	(Common to CSE, IT, CCE)	3	0	0	3	45

Course Objectives

- To introduce the concepts of Basic Object Oriented concepts and Programming Basics.
- To understand in depth about the Classes and Objects.
- To study the Operator overloading and Inheritance concepts.
- To acquaint the Files and Exception Handling concepts.
- Explain Templates and STL.

Course Outcomes

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

CO1 - Describe the programming elements of C++. **(K1)**
CO2 - Explain the concepts Object oriented approach for finding Solutions **(K2)**
CO3 - Solve various real-world problems using inheritance concept **(K3)**
CO4 - Manipulate programs using concepts of files and streams in C++. **(K3)**
CO5 - Exemplify simple applications using templates. **(K3)**

UNIT I INTRODUCTION TO C++ (9 Hrs)

Basic components of a C++ – Program and program structure – Compiling and Executing C++ Program – Data types – Expression and control statements Iteration statements in C++ – Introduction to Arrays – Multidimensional Arrays – Strings and String related Library Functions – Functions – Passing Data to Functions – Scope and Visibility of variables in Functions.

UNIT II PRINCIPLES OF OBJECT ORIENTED PROGRAMMING AND CONSTRUCTORS (9 Hrs)

Basic Concepts of Object-Oriented Programming: Benefits of OOP – Object Oriented Languages – Applications of OOP. Classes and Objects: Data members – Member functions – THIS Pointer – Friends – Friend Functions – Friend Classes – Friend Scope – and Static Functions – Constructors and Destructors – Static variables and Functions in class – Operator Overloading in C++ – Overloading Unary Operators – Overloading binary operators.

UNIT III INHERITANCE (9 Hrs)

Inheritance in C++ – Types of Inheritance – Pointers – Objects and Pointers – Multiple Inheritance. Virtual Functions – Polymorphism – Abstract classes. Real time examples in OOPS.

UNIT IV FILES AND STREAMS (9 Hrs)

Exception Handling: Exception – Basics – Exception Handling Mechanism – Throwing Mechanism – Catching Mechanism – Rethrowing Exception. Standard input and output operations: C++ iostream hierarchy – Standard Input/output Stream Library – Organization Elements of the iostream Library – Programming using Streams – Basic Stream Concepts. File input and output: Reading a File – Managing I/O Streams – Opening a File – Different Methods – Checking for Failure with File Commands – Checking the I/O Status Flags – Dealing with Binary Files – Useful Functions.

UNIT V TEMPLATES AND STL (9 Hrs)

Class templates: Implementing a class template - Implementing class template member functions – Using a class template – Function templates – Implementing function templates – Using template functions – Template instantiation – Class template specialization – Template class partial specialization – Template function specialization – Template parameters – Static members and variables – Templates and friends – Templates and multiple – File projects. Standard Template library: Containers – Iterators and application of container classes.

Text Books

1. Yashavant Kanetkar , " Let Us C++ ",BPB Publications, 2020.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill, 7th Edition, 2018.
3. Herbert Schildt, "C++ - The Complete Reference", McGraw Hill Education, 4th edition, 2017.

Reference Books

1. Bjarne Stroustrup, "A Tour of C++ ", Addison-Wesley Professional; 2nd Edition,2018.
2. Scott Meyers "Effective Modern C++", Shroff/O'Reilly; First Edition,2014.
3. Stanley Lippman, Josée Lajoie , Barbara Moo , "C++ Primer", 5th Edition, 2012.
4. Bjarne Stroustrup, "The Design and Evolution of C++", Addison-Wesley , 2005.
5. Alexanderscu "Modern C++ Design" Pearson; 1st Edition, 2004.

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1. https://www.tutorialspoint.com/cplusplus/index.htm
2. http://www.cplusplus.com/doc/tutorial/
3. https://www.w3schools.com/cpp/
4. https://www.javatpoint.com/cpp-tutorial
5. https://www.geeksforgeeks.org/cpp-tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	3	-	-	-	-	-	-	-	3	-	2
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	2
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	2
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST305 AUTOMATA AND COMPILER DESIGN

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

- To introduce the Finite Automata, NFA and DFA.
- To gain insight into the Context Free Language and Pushdown Automata.
- To understand in depth about Parsing and Turing machine.
- To study about the Lexical Analysis and Syntax Analysis.
- To acquaint the Intermediate Code Generation, Code Optimization and Code Generation.

Course Outcomes

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

CO1 - Understand the concept of Finite Automata, NFA and DFA **(K2)**
CO2 - Understand about Context Free Language and Pushdown Automata. **(K2)**
CO3 - Construct a Turing Machine **(K3)**
CO4 - Explain the concept of Lexical Analysis and Syntax Analysis. **(K3)**
CO5 - Describe the Intermediate code generation, Code Optimization and Code Generation. **(K4)**

UNIT I FINITE AUTOMATA AND REGULAR EXPRESSIONS (12 Hrs)

Introduction: Finite Automata – Deterministic Finite Automata – Non-Deterministic Finite Automata – Conversion from NFA to DFA – NFA with ε moves. Regular Expression: Conversion from Regular Expression to DFA (Direct / Indirect method) – Two way finite automata – Moore and Mealy Machine – Applications of Finite Automata.

UNIT II CONTEXT-FREE GRAMMAR AND LANGUAGES AND PUSHDOWN AUTOMATA (12 Hrs)

Context – Free Grammar and Languages: Definitions and More Examples – Regular Languages and Regular Grammars – Derivation Trees and Ambiguity – Simplified Forms and Normal Forms – Chomsky Normal Form – Greibach Normal Form. Pushdown Automata: Definitions and Examples – A PDA from a Given CFG – A CFG from a Given PDA. Pumping Lemma.

UNIT III TURING MACHINES (12 Hrs)

Turing Machines: Turing Machines as Language Acceptors – Turing Machines for Accepting Regular Languages – Turing Machine for Addition and Subtraction.

UNIT IV LEXICAL ANALYSIS AND SYNTAX ANALYSIS (12 Hrs)

Compilers: The Phases of compiler – Lexical analysis – The role of the lexical analyser – Input buffering – Specification of tokens – Recognition of tokens – A language for specifying lexical analyzers – Design of a lexical analyzer. Parser: Top Down Parser – Predictive Parser, Bottom up Parser – SLR Parser.

UNIT V INTERMEDIATE CODE GENERATION, CODE OPTIMIZATION AND CODE GENERATION(12 Hrs)

Intermediate Code Generation: Declarations – Assignment statements – Boolean expressions – Procedure calls. Code Optimization: Principle sources of optimization – Loop Optimization. Code Generation: Issues in the design of code generator – Simple code generator – Basic blocks and flow graphs – The DAG representation of Basic Block – Generating code form DAGs – Peephole optimization.

Text Books

1. Hopcroft, 'Introduction to Automata Theory, Languages, and Computation", Pearson, 3rd Edition, 2008.
2. Alfred Aho, V. Ravi Sethi, and D. Jeffery Ullman, "Compilers Principles, Techniques and Tools", Addison-Wesley, 2nd Edition, 2007.
3. John C. Martin, "Introduction to Languages and the Theory of Computations", McGraw Hill, 3rd Edition, 2007.

Reference Books

1. Kamala Krithivasan, Rama R, "Introduction to Formal languages Automata Theory and Computation", Pearson, 2019.
2. Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett, 6th Edition, 2016.
3. Anil Malviya, Malabika Datta, "Theory of Computation & Applications - Automata Theory Formal Languages", BPB publications, 2015.
4. Charles N. Fischer and Richard J. Leblanc, "Crafting a Compiler with C", Benjamin Cummings, 2009.
5. Mishra K.L.P, "Theory of Computer Science: Automata, Languages and Computation", Prentice Hall India Learning, 1st Edition, 2006.

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1. https://www.cse.iitb.ac.in/~akg/courses/2019-cs310/index.html
2. https://www.cse.iitm.ac.in/~krishna/cs3300/
3. https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/
4. https://www.javatpoint.com/automata-tutorial
5. https://www.tutorialspoint.com/automata_theory/index.htm

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	3	3	1	1	-	2	-	-	-	3	2	2
2	3	3	3	2	3	1	2	-	2	1	-	2	3	2	2
3	2	3	2	3	2	2	-	-	3	-	-	-	3	2	2
4	3	3	2	3	3	1	-	-	2	-	-	-	3	2	2
5	2	3	3	2	2	2	1	-	2	-	-	-	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST306

OPERATING SYSTEMS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To grasp a fundamental understanding of operating systems and processes
- To learn the concepts of CPU scheduling and deadlock
- To understand synchronization and memory management concepts in OS
- To understand the concepts of file systems and secondary storage structure
- To learn the features of commercial operating systems

Course Outcomes

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

CO1 - Define the concepts of operating systems operations, processes and threads **(K2)**
CO2 - Apply the concepts of CPU scheduling and deadlock techniques **(K3)**
CO3 - Simulate the principles of memory management **(K3)**
CO4 - Identify appropriate file system and disk organizations for a variety of computing scenario **(K3)**
CO5 - Examine the features of various open source operating systems **(K4)**

UNIT I INTRODUCTION AND PROCESS MANAGEMENT

(9 Hrs)

Operating system structure – Operating system operations – Process management – Memory management – Storage management – Protection and Security – System structures: Operating system services – System calls – Types of system calls -- System programs. Process scheduling – Operations on processes – Inter-process communication. Case study: Linux process management

UNIT II CPU SCHEDULING AND DEADLOCK

(9 Hrs)

Overview of threads – Multithreading models – Threading issues – Basic concepts of process scheduling – Scheduling criteria – Scheduling algorithms – Multiple processor scheduling, Dead Lock: Characterization – Prevention Detection – Avoidance and Recovery. Case Study: Linux Scheduling.

UNIT III CONCURRENT PROCESSES AND MEMORY MANAGEMENT

(9 Hrs)

Process synchronization: The Critical Section Problem – Peterson's solution – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors. Memory Management: Swapping – Contiguous memory allocation – Paging – Structure of the Page Table – Segmentation, Demand Paging – Page Replacement – Allocation of Frames – Thrashing. Case Study: Linux Memory Management.

UNIT IV FILE SYSTEMS AND SECONDARY STORAGE STRUCTURE

(9 Hrs)

File Concept – Access Methods – Directory structure – File system mounting – File sharing – Protection – 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.

UNIT V CASE STUDY

(9 Hrs)

LINUX System: Basic Concepts – System administration – Requirements for Linux System Administrator – Setting up a LINUX multifunction server – Domain Name System – Setting up local network services. Virtualization: Basic concepts – Setting Up Xen – VMware on LINUX Host and adding guest OS. Comparison of LINUX and MICROSOFT Windows operating system concepts.

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons Ninth Edition, 2017.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, 3rd Edition, 2015.
3. Gary Nutt, "Operating Systems - A Modern Perspective", Pearson Education, Second Edition, 2013.

Reference Books

1. William Stallings, "Operating System", Prentice Hall of India, 6th Edition, 2015.
2. Thomas Anderson and Michael Dahlin, "Operating Systems principles and practice", Wiley, 2nd Edition, 2014.
3. Harvey M. Deitel, "Operating Systems", Pearson Education, Third Edition, 2013.
4. Silberschatz, Galvin, "Operating System Concepts", Wiley, Student Edition, 2006.
5. William Stallings, "Operating System: Internals and design Principles", Old Edition (7), Pearson Education India.

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2. http://www.tcyonline.com/tests/operating-system-concepts
3. http://www.galvin.info/history-of-operating-system-concepts-textbook
4. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html
5. https://www.cse.iitk.ac.in/pages/CS330.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	-	1	1	1	1	-	-	-	-	-	2	1	2
2	-	2	-	2	2	2	2	-	-	-	-	2	2	1	2
3	2	2	2	2	2	-	-	-	-	-	2	-	2	1	2
4	3	3	-	3	3	3	3	3	-	-	3	3	2	1	2
5	3	3	3	3	3	3	3	3	-	3	-	3	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST307 DATA COMMUNICATIONS AND COMPUTER NETWORKS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To gain and explore the basic concepts of Data Communications.
- To understand the signals and transmission media involved in the physical layer.
- To learn the basic concepts of data link layer services and network layer communication protocols
- To synthesize various load characteristics and network traffic conditions, decide the transport protocols to be used.
- To analyze and compare the different protocols available in the application layer and Network Security.

Course Outcomes

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

CO1 - Analyze the network components and network standards. **(K1)**

CO2 - Determine the Physical layer functionalities, Transmission media and Switching. **(K3)**

CO3 - Analyze the Error correction and detection techniques and determine the proper usage of IP address, subnet mask and default gateway in a routed network **(K3)**

CO4 - Describe, analyze and compare different protocols in transport layer. **(K4)**

CO5 - Analyze the functional working of different protocols of application layer and Network Security. **(K4)**

UNIT I DATA COMMUNICATIONS

(9 Hrs)

Overview of Data Communications – Networks and its types – Network topologies – Transmission technologies: Digital signaling – Analog Signaling – Networks Models: Protocol Layering – OSI reference model – TCP/IP Protocol suite.

UNIT II PHYSICAL LAYER AND MEDIA

(9 Hrs)

Data and Signals: Analog and digital – Periodic Analog Signals – Digital Signals – Digital Transmission: Digital-to-Digital Conversion – Analog to Digital Conversion – Transmission Media: Guided and unguided media. Switching: Introduction – Circuit Switching – Packet switching.

UNIT III DATA LINK LAYER AND NETWORK LAYER

(9 Hrs)

Data link layer design issues – Error Detection and Correction – Sliding window protocols – Network Layer Design Issues – Routing Algorithms: The Optimality Principle – Shortest path algorithm – Distance vector routing – Link state routing, Hierarchical routing – Broadcast, Multicast routing – The Network Layer in the Internet:IPV4 – IPV6.

UNIT IV TRANSPORT LAYER

(9 Hrs)

The Transport Service – Elements of Transport Protocols – Transport layer Congestion Control – Transport Layer Protocols: User Datagram Protocol (UDP) – Transmission Control Protocol (TCP):TCP Connection Establishment – TCP Connection Release.

UNIT V APPLICATION LAYER AND NETWORK SECURITY

(9 Hrs)

Application Layer Protocols – HTTP – FTP – Telnet – Email Protocols: SMTP – POP3 – IMAP and MIME – DNS – Network Security: Cryptography – Public Key Algorithms – Firewalls.

Text Books

1. Behrouz A. Forouzan, "Data Communications and Networking", TMH, Fifth Edition, 2013.
2. Larry L. Peterson and Bruce S. Davie, "Computer Networks- A system approach", 5th edition, Elsevier, 2012.
3. Andrew Tanenbaum and David J. Wetherall "Computer Networks", Prentice Hall, 5th Edition , 2011

Reference Books

1. Andrew S.Tanenbaum, "Computer Networks", Pearson Publication, 4th Edition, 2018.
2. Pallapamanvi. V , "Data Communications and Computer Networks", PHI, 4th edition, 2014.
3. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach: International Edition", Pearson Education, Sixth edition, 2013.
4. Stallings, W., "Data and Computer Communications", 10th Ed., Prentice Hall Int. Ed., 2013.
5. Dayanand Ambawade, Deven Shah, "Advanced Computer Networks", Dreamtech Press, 1st edition, 2011.

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4. https://lecturenotes.in
5. https://www.cse.iitk.ac.in/users/dheeraj/cs425/

COs/POs/PSOs Mapping

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1	-	2	2	2	2	2	2	-	-	2	-	-	3	2	-
2	2	2	2	2	2	2	-	-	-	-	-	-	3	-	-
3	3	3	3	3	-	3	3			3	3	3	3	2	2
4	1	1	1	1	-	-	1	-	-	-	-	-	1	-	1
5	3	3	3	3	3	3	3	-	-	-	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20HSP301 **GENERAL PROFICIENCY– I**

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To enrich strong vocabulary and decoding skills through comprehension analysis
- To advance communication and leadership skills pragmatically
- To pronounce English sounds in isolation and in connected speech
- To expand effective written communication skills to meet organizational goals
- To extend knowledge on verbal aptitude and prepare for interviews

Course Outcomes

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

CO1 - Interpret meaning and apply reading strategies in technical and non-technical context **(K2)**
CO2 - Develop interpersonal communication skills professionally **(K3)**
CO3 - Infer the distinct speech sounds and overcome native language influence **(K2)**
CO4 - Demonstrate various forms of formal writing **(K2)**
CO5 - Apply the techniques of verbal aptitude in competitive exams **(K3)**

UNIT I COMPREHENSION ANALYSIS

(6 Hrs)

Listening: Listening Comprehension (IELTS based) – Speaking: Break the iceberg – Reading: Reading technical passage (IELTS based) - Writing: Writing Task: 1 (IELTS: Graph/ Process /Chart Description) Vocabulary: Synonyms (IELTS)

UNIT II PERSONALITY DEVELOPMENT

(6 Hrs)

Listening: Interview Videos- Speaking: Extempore& Presentation (Soft Skills) – Reading: British & American Vocabulary, Read and review (Books, Magazines) - Writing: SWOT Analysis Vocabulary: Idioms (IELTS)

UNIT III INFERENTIAL LEARNING

(6 Hrs)

Listening: Listening Speech sounds to overcome Mother Tongue Influence, Anecdotes – Speaking: Interpersonal Interaction & Situational attribution–Reading: Distinguish between facts & opinions – Writing: Writing Conversation to different context Vocabulary: Phrasal Verbs (IELTS)

UNIT IV INTERPRETATION AND FUNCTIONAL WRITING

(6 Hrs)

Listening: Group Discussion videos – Speaking: Group Discussion Practice - Reading: Interpretation of data - Graph, table, chart, diagram (IELTS based) – Writing: Writing Task: 2 (IELTS) Vocabulary: Collocations (IELTS)

UNIT V APTITUDE

(6 Hrs)

Language Enhancement: Articles, Preposition, Tenses. Verbal Ability Enhancement: Blood Relation, Completing Statements – Cloze test, Spotting Errors – Sentence Improvement, One Word Substitution, Word Analogy, Word Groups(GATE)

Reference Books

1. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, 2012.
2. Aggarwal, R. S, "A Modern Approach to Verbal & Non Verbal Reasoning", S. Chand, 2010.
3. Wren, Percival Christopher, and Wren Martin, "High School English Grammar and Composition", S: Chand, 2005.
4. Bailey, Stephen, "Academic writing: A practical guide for students", Psychology Press, 2003.
5. Mn,Taylor, and Grant Taylor, "English Conversation Practice", Tata McGraw-Hill Education, 2001.

Web References

1. https://www.ielts-exam.net/grammar/
2. https://ieltsfocus.com/2017/08/02/collocations-ielts/
3. https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
4. https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
5. https://www.examsbook.com/word-analogy-test-questions-with-answers

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
2	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20BSP323	**NUMERICAL METHODS LABORATORY** (Common to CSE & IT)	**0**	**0**	**2**	**1**	**30**

Course Objectives

- To learn the techniques of non – linear equation using c program.
- To understand the numerical solution of a matrix by power - method using c program.
- To know the techniques of solving simultaneous equations using c program.
- To introduce the numerical techniques of integration using c programming.
- To study about the numerical solution of parabolic equation.

Course Outcomes

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

CO 1 – Find out the root of the Algebraic and Transcendental equations using C Programming. **(K3)**
CO 2 – Know the concept of matrix by power method using C programming. **(K3)**
CO 3 – Solve the system of simultaneous equations using C programming. **(K3)**
CO 4 – Implement numerical techniques of integration using C programming. **(K3)**
CO 5 – Find the numerical solution of parabolic equation using C programming **(K3)**

List of experiments:

1. Roots of non – linear equation using bisection method.
2. Roots of non – linear equation using Newton's method.
3. Find the largest Eigen value of a matrix by power - method.
4. Solve the system of linear equations using Gauss - Elimination method.
5. Solve the system of linear equations using Gauss - Jordan method.
6. Solve the system of linear equations using Gauss - Seidal iteration method.
7. Find the area by using trapezoidal rule.
8. Find the area by using Simpson's 1/3 rule.
9. Find the area by using Simpson's 3/8 rule.
10. Find the numerical solution of heat equation.

Reference Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., (Seventh Edition) 2019.
4. K. Sankara Rao, "Numerical Methods for Scientists and Engineers", PHI Learning Pvt.Ltd, New Delhi, 3rd Edition,2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

Web References

1. http://nptel.ac.in/courses/111107063
2. http://nptel.ac.in/courses/122102009
3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
2	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
5	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20ESP357 DATA STRUCTURES LABORATORY

(Common to ECE, EEE, IT, ICE,
MECH,CIVIL,BME, MECHTRONICS,CCE)

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To understand the basic concepts of Data Structures.
- To learn about the concepts of Searching Techniques.
- To explore about the concepts of Sorting Techniques.
- To know about the linear Data Structures.
- To study about non-linear Data Structures.

Course Outcomes

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

CO1 - Analyze the algorithm's / program's efficiency in terms of time and space complexity.**(K3)**
CO2 - Solve the given problem by identifying the appropriate Data Structure.**(K3)**
CO3 - Solve the problems of searching and sorting techniques. **(K3)**
CO4 - Solve problems in linear Data Structures.**(K4)**
CO5 - Solve problems in non-linear Data Structures. **(K4)**

List of Exercises

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a)Delete an element from list c) Search for a key element in list d) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
    a) Insert an element into a binary search tree.
    b) Delete an element from a binary search tree.
    c) Search for a key element in a binary search tree.
8. Write a C program that use recursive functions to traverse the given binary tree in
    a) Preorder b) Inorder and c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.
2. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st Edition, 2017.
4. Reema Thareja, "Data structures using C", Oxford University, 2nd Edition, 2014.
5. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st Edition, 2019.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. https://www.w3schools.in/data-structures-tutorial/intro/
3. https://nptel.ac.in/courses/106103069/
4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. https://nptel.ac.in/courses/106103069/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20ESP360

PROGRAMMING IN C++ LABORATORY

(Common to CSE, IT, CCE)

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To introduce the concepts of Basic Object Oriented concepts and Programming Basics.
- To gain insight into the Functions and Array usages using C++.
- To understand in depth about the Classes and Objects.
- To study the Operator overloading and Inheritance concepts.
- To acquaint the Files and Exception Handling concepts.

Course Outcomes

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

CO1 - Implement the Object Oriented concepts in simple applications. **(K3)**
CO2 - Employ the Functions and Arrays in simple programs. **(K3)**
CO3 - Demonstrate simple programs with Classes and Objects. **(K3)**
CO4 - Illustrate Operator overloading and Inheritance concepts. **(K3)**
CO5 - Develop programs using Files and Exception Handling concepts. **(K3)**

List of Exercises

1. Control Structures and Looping Structures.
2. Array Usages.
3. Class Declarations, Definition, and Accessing Class Members.
4. Constructor, parameterized constructor and copyconstructors.
5. Friend Function and Friend Class.
6. Function Overloading and Constructor Overloading.
7. Operator Overloading.
8. Access Members of a Class Using Pointer to Object Members.
9. Single Inheritance and Multiple Inheritances.
10. Multilevel inheritance, Hierarchical Inheritance and Hybrid Inheritance.
11. Virtual Classes and Abstract Classes.
12. Exception Handling.
13. IOStream, IStream, Ostream classes and their usages.
14. FileStream Operations.
15. Template based program to sort the given list of elements.
16. Real world examples

Reference Books

1. Yashavant Kanetkar, "Let Us C++ ", BPB Publications, 2020.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill, 7th Edition, 2018.
3. Herbert Schildt, "C++ - The Complete Reference", McGraw Hill Education, 4th Edition, 2017.
4. Stanley B. Lippman, Stanley Lippman, Barbara Moo, "C++ Primer", Addison-Wesley Professional, 5th edition 2012.
5. Herbert Schildt, "C++ - From the Ground Up", McGraw Hill Education, 2nd edition, 2010.

Web References

1. http://www.cplusplus.com/doc/tutorial/
2. https://www.tutorialspoint.com/cplusplus/index.htm
3. https://www.w3schools.com/cpp/
4. https://www.javatpoint.com/cpp-tutorial
5. https://www.geeksforgeeks.org/cpp-tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1
2	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1
3	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1
4	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1
5	3	2	1	1	3	-	-	-	-	-	-	-	2	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSP303 LINUX INTERNALS LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To learn basic UNIX / LINUX commands
- To develop programs in Linux environment using system calls.
- To implement the CPU scheduling algorithms.
- To implement Deadlock handling algorithm.
- To develop solutions for synchronization problems using semaphores

Course Outcomes

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

CO1 - Understand the basic commands for Linux. **(K2)**
CO2 - Develop simple shell programs. **(K2)**
CO3 - Implement different Scheduling Algorithms **(K5)**
CO4 - Apply the basic concepts of Deadlock Handling procedures. **(K4)**
CO5 - Simulate Critical Section problem using Semaphore **(K4)**

List of Exercises

1. Study of basic UNIX/Linux commands
2. Shell Programming - I
    (a) To Write a Shell program to count the number of words in a file.
    (b) To Write a Shell program to calculate the factorial of a given number.
    (c) To write a Shell program to generate Fibonacci series.
    (d) Write a Shell Program to wish the user based on the login time.
3. Shell Programming - II
    (a) Loops
    (b) Patterns
    (c) Expansions
    (d) Substitutions
4. Programs using the following system calls of UNIX/Linux operating system: fork, exec, getpid, exit, wait, close, stat, open dir, read dir.
5. To write a program to simulate cat command.
6. To write a program to simulate head and tail commands.
7. Simulate UNIX commands like ls, grep.
8. Process Scheduling- FCFS, SJF, Priority and Round robin.
9. Implementation of Banker's algorithm.
10. Write a C program to simulate producer and consumer problem using semaphores

Reference Books

1. William Stallings, "Operating System", Pearson Education, Sixth edition, 2015.
2. Andrew S. Tanenbaum, Modern Operating Systems,3rd edition Prentice Hall of India Pvt. Ltd, 2015.
3. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt, Third Edition, 2013
4. William Stallings, "Operating System: Internals and design Principles", Old Edition(7), Pearson Education, 2013.
5. Silberschatz, Galvin, "Operating System Concepts", Wiley, Student Edition, 2006.

Web References

1. https://www.geeksforgeeks.org
2. http://avanthioslab.blogspot.com/2016/08/file-organization-techniques.html
3. https://www.programming9.com/programs/c-programs/285-page-replacement-programs-in-c

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	-	1	1	1	1	-	-	-	-	-	-	-	2
2	-	2	-	2	2	2	2	-	-	-	-	2	-	-	2
3	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2
4	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2
5	2	2	2	2	2	-	-	-	-	-	2	-	-	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSC3XX	CERTIFICATION COURSES	L	T	P	C	Hrs
		0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

U20CSS302 COMPUTER ASSEMBLY AND TROUBLESHOOTING

L	T	P	C	Hrs
0	0	2	0	30

Course Objectives

- Demonstrate Computer assembly and parts identification.
- Inculcate how to install Operating system.
- Understand how to setup PC in a network
- Understand the troubleshooting of printers
- Troubleshooting of PC related problems

Course Outcomes

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

CO1 - Acquire knowledge to assemble PCs.**(K3)**
CO2 - Understand to install operating system in a PC. **(K3)**
CO3 - Design a simple LAN network. **(K3)**
CO4 - Apply troubleshooting methods in printers. **(K3)**
CO5 - Apply troubleshooting approaches in PC. **(K3)**

List of Exercises

1. Assembling of a Personal Computer:
   a) Identifying parts of mother board, power connections and locating other connectors.
   b) Interconnection of disk drive units, keyboard, mouse and monitor.
2. Partitioning the hard disk using FDISK/ Partition Magic/ Disk Manager.
3. Installation of Windows.
4. Install and Configure Dual OS Installation.
5. Networking PCs: setting up Wired/ Wireless LANs and troubleshooting.
6. Identify, install and manage network connections Configuring IP address and Domain name system.
7. Networking of devices using Bluetooth interface.
8. Installation Antivirus and configure the antivirus.
9. Installation of printer and scanner software.
10. Trouble shooting and Managing Systems.
11. Serial Communication: To establish serial communication (RS232C) between a pair of PCs.

Reference Books

1. Peter Norton, "Introduction to Computers", Mc Graw Hill Publishers, 7th Edition, 2017.
2. David Anfinson and Ken Quamme, "IT Essentials PC Hardware and Software Companion Guide", Pearson Education, Third Edition, 2010
3. Vikas Gupta, "Comdex Information Technology course tool kit", WILEY Dreamtech, 2009
4. Scott Muller, "Upgrading and Repairing PC's", 18th Edition, Pearson Education. 2007.
5. Kate J. Chase, " PC Hardware and A+Handbook", PHI (Microsoft), 2004.

Web References

1. https://en.wikibooks.org/wiki/How_To_Assemble_A_Desktop_PC/Assembly
2. https://www.instructables.com/id/How-To-Assemble-A-Basic-Desktop-PC/
3. https://www.coursera.org/lecture/system-administration-it-infrastructure-services/troubleshooting-and-managing-issues-ks1P1

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
2	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
3	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
4	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1
5	3	3	3	1	-	-	-	-	2	-	-	2	1	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSS302 **APTITUDE - I**

L	T	P	C	Hrs
0	0	2	0	30

Course Contents

- Number System - Basics, Properties & Type of Numbers - Divisibility Rules.
- LCM & HCF - Unit Digit Concept [Cyclicity Method].
- Decimals, Simplification. Ratio & Proportion - Compounded & Duplicate Ratio - Inverse Ratio - Shortcut to Find Ratio - Continuous Proportion - Mean & Divisibility Proportion.
- Ages - Both Data is in Ratio or Time Format - One Data in Ratio or Time Format & Other Data in Sum, Difference or Product.
- Logical [Puzzles] Method.
- Average - Basics & Finding Average in Complex - Replacement & Alteration Method - Average Speed Finding Problems.
- Allegation & Mixtures.
- Ratio of Mixture - Finding the Kilogram through Ratio.
- Mean Value Method.
- Ratio Mixture [Fraction Method] - Iteration Method.

		L	T	P	C	Hrs
U20CSS302	**ELECTRONIC DEVICES AND CIRCUITS**	0	0	2	0	30

Course Objectives

- To provide the basic operation and applications of electronic devices.
- To provide working knowledge of the working of analogue electronic circuits.
- To provide the basic knowledge of design and implementation of amplifier.
- To provide the basic knowledge of design and implementation of diodes and transistors.
- To provide experience in design and implementation of analogue circuits using discrete electronic components.

Course Outcomes

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

CO1 - Student should be able to understand the working of analog circuits like rectifiers, clippers, clampers etc.**(K3)**

CO2 - Student should be able to design and implement circuits like RC coupled amplifier, tuned amplifier, Schmitt trigger etc.**(K3)**

CO3 - Student should be able to design and demonstrate the functioning of regulators, oscillators and power amplifiers.**(K3)**

CO4 - Students should be able to analyze and interpret the characteristics of diodes and transistors.**(K3)**

CO5 - Students should be able to function effectively as an individual and in a team to accomplish the given task.**(K3)**

List of Exercises

1. VI characteristics of rectifier and Zener diodes
2. RC integrating and differentiating circuits (Transient analysis with different inputs and frequency response)
3. Clipping and clamping circuits (Transients and transfer characteristics)
4. Full-wave rectifiers - with and without filter - ripple factor and regulation
5. Simple Zener voltage regulator (load and line regulation)
6. Characteristics of BJT in CE configuration and evaluation of parameters
7. Characteristics of MOSFET in CS configuration and evaluation of parameters
8. RC Coupled CE amplifier - frequency response characteristics.
9. MOSFET amplifier (CS) - frequency response characteristics.
10. Cascade amplifier – gain and frequency response
11. Cascade amplifier – frequency response
12. Feedback amplifiers (current series, voltage series) - gain and frequency response
13. Low frequency oscillators – RC phase shift, Wien bridge
14. High frequency oscillators – Colpitt"s and Hartley
15. Power amplifiers (transformer less), Class B and Class AB.
16. Transistor series voltage regulator (load and line regulation)
17. Tuned amplifier – frequency response
18. Bootstrap sweep circuit
19. Multi vibrators – astable, monostable, bistable
20. Schmitt trigger

Reference Books

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education Eleventh Edition, 2015.
2. M. Morris Mano, "Digital Design", Pearson Education, 6th Edition, 2017.
3. David A Bell, "Fundamentals of Electronic Devices and Circuits", Fifth edition Oxford Press, 2009
4. Thomas L. Floyd, "Digital Fundamentals", Tenth Edition, Pearson Education, NewDelhi, 2009.
5. Varsha Agrawal Anil K. Maini,"Electronic Devices and Circuits",Wiley,1st edition,2019.

Web References

1. http://www.electronics-tutorials.ws
2. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
3. https://nptel.ac.in/courses/117106114/
4. https://nptel.ac.in/courses/117106086/
5. https://www.vlab.co.in/broad-area-electronics-and-communications

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	1	-	-
2	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
3	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-
4	3	2	1	1	3	-	-	-	-	-	-	-	1	-	-
5	3	2	1	1	-	-	-	-	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSM303

PHYSICAL EDUCATION

L	T	P	C	Hrs
0	0	2	-	30

Physical Education is compulsory for all the Undergraduate students and Pass in this course is mandatory for the award of degree. Physical Education activities will include games and sports/extension lectures. The student participation shall be for minimum period of 30 hours. Physical Education activities will be monitored by the Director of Physical Education. Pass/Fail will be determined on the basis of participation, attendance, performance and conduct. If a candidate fails, he/she has to repeat the course in the subsequent years.

SEMESTER IV

		L	T	P	C	Hrs
U20BST432	**DISCRETE MATHEMATICS AND GRAPH THEORY** (Common to CSE & IT)	2	2	0	3	60

Course Objectives

- To learn the concept of symbolic logic and truth tables.
- To apply the rules of Inference and predicate calculus.
- Analyze the asymptotic performance of Lattices.
- To understand the fundamental concepts of Graph theory.
- Synthesize efficient algorithms in Graph theory and trees.

Course Outcomes

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

CO1 - Construct mathematical arguments using logical connectives and truth tables. **(K3)**
CO2 - Apply propositional and predicate logic and quantifiers. **(K3)**
CO3 - Solve the problems using counting techniques in Lattices. **(K3)**
CO4 - Familiarize the different types of Graphs. **(K3)**
CO5 - Understand various types of trees and methods for algorithms. **(K2)**

UNIT I MATHEMATICAL LOGIC AND STATEMENT CALCULUS

(12 Hrs)

Introduction – Connectives – Statement formulae – Truth table – Tautologies – Equivalence of Statement formulae - NAND and NOR Connectives – Implications – Principal conjunctive and disjunctive normal forms.

UNIT II PREDICATE CALCULUS

(12 Hrs)

Inference calculus – Derivation process – Conditional proof – Indirect method of proof – Automatic theorem proving – Predicate calculus.

UNIT III LATTICES

(12 Hrs)

Boolean algebra – Lattices – Sub lattices – Complemented and Distributive lattices. Partially Ordered Relations – Lattices as Posets – Hasse Diagram – Properties of Lattices.

UNIT IV GRAPH THEORY

(12 Hrs)

Graphs – Applications of graphs – Degree – Pendant and isolated vertices – Isomorphism – Sub graphs – Walks – Paths and Circuits – Connected graphs – Euler graphs – Hamilton paths and circuits – Complete graph.

UNIT V TREES

(12 Hrs)

Trees – Properties of Trees – Pendant vertices in a Tree – Kruskal algorithm.

Text Books

1. P.Tremblay and R.Manohar, "Discrete Mathematical structures with applications to computer science", 13th reprint, Tata McGraw - Hill publishers, 2002.
2. Narsinghdeo, "Graph Theory with Applications to Engineering and Computer Science", Dover Publications New York , 1st Edition, 2016.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw - Hill Publishing Company, Pvt. Ltd., New Delhi, 5th Edition, 2003.

Reference Books

1. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw - Hill Education Pvt. Ltd., 3rd Edition, 2008.
2. F. Harary, "Graph theory", Narosa publishing house, New Delhi, 1988.
3. Douglas B. West, "Introduction to Graph theory", Pearson Education, 2nd Edition, 2002.
4. Oscar Levin, "Discrete Mathematics An Open Introduction", 3rd Edition, 4th Printing: 2019 ISBN: 978-1792901690
5. Edgar C Coodare and Michael M Parmenter, "Discrete Mathematics with Graph Theory", Pearson Education; 3rd Edition, 2015.

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1. https://www.researchgate.net/publication/1922282_Discrete_Mathematics_for_Computer_Science_Some_Notes
2. https://nptel.ac.in/courses/111/107/111107058/
3. https://nptel.ac.in/courses/106/106/106106183/
4. https://www.pdfdrive.com/discrete-mathematics-for-computer-science-e17017833.html
5. https://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
2	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
3	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	1	1
5	2	1	-	-	-	-	-	-	-	-	-	1	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20EST467	PROGRAMMING IN JAVA	L	T	P	C	Hrs
		3	0	0	3	45

(Common to CSE, ECE, EEE, IT, ICE, MECH,
CIVIL, BME, MECHTRONICS, CCE)

Course Objectives

- To gain and explore the knowledge of java programming
- To know the principles of inheritances, packages, interfaces
- To get familiarized to generic programming, multithreading concepts.
- To gain and explore the advanced concepts in Java.
- To explore database connectivity

Course Outcomes

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

CO1 - Write a maintainable java program for a given algorithm and implement the same. **(K2)**
CO2 - Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**
CO3 - Create java applications using exception handling, thread and generic programming. **(K3)**
CO4 - Build java distributed applications using Collections and IO streams. **(K3)**
CO5 - Exemplify simple graphical user interfaces using GUI components and database programs. **(K3)**

UNIT I INTRODUCTION TO JAVA PROGRAMMING (9 Hrs)

The History and Evolution of Java – Byte code – Java buzzwords – Data types – Variables – Arrays – operators – Control statements – Type conversion and casting. Concepts of classes and objects: Basic Concepts of OOPs – constructors – static keyword – Final with data – Access control – This key word – Garbage collection – Nested classes and inner classes – String class

UNIT II INHERITANCE, PACKAGES AND INTERFACES (9 Hrs)

Inheritance: Basic concepts – Forms of inheritance – Super key word – method overriding – Abstract classes – Dynamic method dispatch – The Object class. Packages: Defining – Creating and Accessing – importing packages. Interfaces: Defining – Implementing – Applying – Variables and extending interfaces

UNIT III EXCEPTION HANDLING, MULTITHREADING (9 Hrs)

Concepts of Exception handling – Types of exceptions – Creating own exception – Concepts of Multithreading – creating multiple threads – Synchronization – Inter thread communication. Enumeration: Autoboxing – Generics.

UNIT IV COLLECTIONS, I/O STREAMS (9 Hrs)

Collections: List – Vector – Stack – Queue – Dequeue – Set – Sorted Set. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files.

UNIT V EVENT DRIVEN PROGRAMMING AND JDBC (9 Hrs)

Events – Delegation event model – Event handling – Adapter classes. AWT: Concepts of components – Font class – Color class and Graphics. Introduction to Swing: Layout management - Swing Components. Java Database Connectivity. Develop real time applications.

Text Books

1. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, 11th Edition, 2018.
2. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
3. Herbert Schildt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.

Reference Books

1. H.M.Dietel and P.J.Dietel, "Java How to Program", 11th Edition, Pearson Education/PHI, 2017.
2. Nageshvar rao, "Core Java and Integrated Approach", 1st Edition, Dreamtech, 2016.
3. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", Prentice Hall, 9th Edition, 2013.
4. P.J. Dietel and H.M Dietel, "Java for Programmers", Pearson Education, 9th Edition, 2011.
5. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Pearson Education, 8th Edition, 2008.

Web References

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog
5. https://www.geeksforgeeks.org

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST408	**DATABASE MANAGEMENT SYSTEMS**	**L**	**T**	**P**	**C**	**Hrs**
		3	**0**	**0**	**3**	**45**

Course Objectives

- To learn about Database Structure and Data Models.
- To study SQL Commands for storing and retrieving data into the database.
- To study the Relational database system design
- To understand the concept of Transactions
- To understand the concept of Concurrency Control and Recovery System

Course Outcomes

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

CO1 - Design conceptual data model using Entity Relationship Diagram. **(K2)**
CO2 - Design conceptual and logical database models for an application. **(K3)**
CO3 - Normalize relational database design of an application. **(K3)**
CO4 - Explain the need for Indexing, Hashing and Transactions in database. **(K2)**
CO5 - Understand the strategies for providing security, privacy, and recovery of data. **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Database System Application – Purpose of Database Systems – View of Data – Database Languages – Relational Database – Database Design – System Structure – Database Architecture. Database Design and E-R Model: Overview of the Design Process – The E-R Model – Constraints – E-R Diagrams- E-R Design Issues – Extended E-R features – Reduction to Relational Schemas – Other aspects of Database Design.

UNIT II RELATIONAL MODEL (9 Hrs)

Structure of Relational Database – Fundamental Relational Algebra Operations – Extended Relational Algebra Operations – Modification of the Database. Structured Query Language: Introduction – Basic Structure of SQL Queries – Set Operations – Additional Basic Operations – Aggregate Functions – Null Values – Nested Sub queries – Views – Join Expression.

UNIT III RELATIONAL DATABASE DESIGN (9 Hrs)

Features of Good Relational Designs – 1NF – 2NF – 3NF and 4NF with Examples. Atomic Domains and first Normal form – Decomposition using Functional Dependencies – Functional Dependency Theory – Algorithm for Decomposition – Decomposition using Multivalued Dependencies.

UNIT IV INDEXING - HASHING AND TRANSACTION MANAGEMENT (9 Hrs)

Basic Concepts – Ordered Indices – B+ Tree Index Files – B-Tree Files – Multiples – Key Access – Static Hashing – Dynamic Hashing – Comparison of Ordered Indexing and Hashing – Bitmap Indices. Transaction Management: Transaction concept – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation and Atomicity – Serializability – Recoverability – Transaction Isolation Levels – Implementation of Isolation Levels.

UNIT V QUERY PROCESSING AND CONCURRENCY CONTROL (9 Hrs)

Query Processing: Measures of Query Cost – Selection Operation – Sorting – Join Operation – Other Operations – Evaluation of Expressions. Query optimization: Overview – Transformation of Relational Expressions – Estimating Statistics of Expression Results – Choice of Evaluation Plan Concurrency Control: Lock Based Protocols – Timestamp Based Protocols – Validation Based Protocols. Recovery System: Failure Classification – Remote Backup Systems.

Text Books

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", McGraw-Hill, 7th Edition, 2019.
2. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, 2018.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems The Complete Book" Prentice Hall, 2nd Edition, 2014.

Reference Books

1. Raghu Ramakrishna, Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition, 2014.
2. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
3. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database System", Pearson Education, 8th Edition, 2006.
4. Paul Beynon-Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003.
5. Mukesh Chandra Negi, "Fundamentals of Database Management Systems", BPB Publications, 2019.

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2. http://dev.mysql.com/doc/
3. http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf
4. https://nptel.ac.in/courses/106/106/106106095/
5. https://www.tutorialspoint.com/dbms/index.htm

COs/POs/PSOs Mapping

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1	1	2	2	2	1	2	2	1	1	2	-	3	2	3	2
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3	3	3	3	3	2	2	2	-	2	1	2	2	3	2	3
4	3	2	3	3	1	2	2	-	2	1	2	3	3	3	3
5	3	3	3	3	2	2	2	-	2	1	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CST409	DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE and CCE)	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To understand the performance analysis of Algorithms.
- To compare the searching and traversal techniques.
- To understand the problems based on divide and conquer and Greedy method.
- To understand the problems based on dynamic programming and backtracking methods.
- To understand the problems based on branch and bound and NP-Hard.

Course Outcomes

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

CO1 - Analyze and improve the efficiency of algorithms and estimate the performance of algorithm. **(K2)**

CO2 - Apply different designing methods for development of algorithms to realistic problems. **(K3)**

CO3 - Determine the Divide and Conquer, Greedy paradigms and explain when an algorithmic design situation calls for it. **(K3)**

CO4 - Determine the Dynamic programming, Backtracking paradigms and explain when an algorithmic design situation calls for it. **(K3)**

CO5 - Interpret the Branch and Bound and NP-Hard paradigms and explain when an algorithmic design situation calls for it. **(K2)**

UNIT I INTRODUCTION TO ALGORITHM AND NOTATIONS

(12 Hrs)

Introduction – Algorithm – Pseudo code for expressing algorithms – Performance Analysis – Time complexity – Space complexity – Asymptotic Notation – Big oh notation – Omega notation – Theta notation and Little oh notation – Probabilistic analysis – Amortized analysis.

UNIT II DIVIDE AND CONQUER, GREEDY METHOD

(12 Hrs)

Divide and Conquer method: Solving recurrence relations – Applications – Binary search – Merge sort – Quick sort. Greedy method: General method – applications – Job sequencing with deadlines – Knapsack problem – Minimum cost spanning trees – Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING

(12 Hrs)

Dynamic Programming: Applications – Multistage graphs – Optimal binary search trees – 0/1 knapsack problem, All pairs shortest path problem – Traveling sales person problem – Reliability design – Chained Matrix Multiplication – Graph Applications: AND/OR graphs – Connected components – Identification of articulation points – Bi-connected components.

UNIT IV BACKTRACKING METHOD

(12 Hrs)

Backtracking: General method. Applications – N – queen problem – Sum of subsets problem – Graph coloring – Hamiltonian cycle – 0/1 Knapsack Problem.

UNIT V BRANCH AND BOUND, NP-HARD PROBLEMS

(12 Hrs)

General method – Applications – Traveling sales person problem – 0/1 knapsack problem – LC Branch and Bound solution – FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts – Non deterministic algorithms – NP-Hard and NP-Complete classes.

Text Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.
2. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
3. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", PHI/Pearson Education, 3rd Edition, 2009.

Reference Books

1. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.
2. Donald E Knuth, "The Art of Computer Programming, Volume I & II", Addison Wessely, Third Edition, 2011.
3. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education, 3rd Edition, 2010.
4. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India, 2006.
5. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

Web References

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
2. https://www.javatpoint.com/daa-tutorial
3. https://www.guru99.com/design-analysis-algorithms-tutorial.html
4. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
5. https://swayam.gov.in/nd1_noc20_cs71/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	2	2	1	-	-	-	-	-	2	3	2
2	3	2	3	3	2	2	1	-	-	-	-	-	3	3	3
3	3	3	3	3	2	2	2	-	2	-	-	-	3	2	3
4	3	2	3	3	3	2	2	-	-	-	3	-	3	3	3
5	3	3	3	3	2	2	2	-	-	-	3	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20HSP402	**GENERAL PROFICIENCY–II**	0	0	2	1	30

Course Objectives

- To examine various standardized test in English language
- To recognize the key features of various technical writing
- To integrate LSRW skills to endorse multifarious skill set in practical situation
- To understand the factors that influence the usage of grammar
- To understand the basic concepts of logical reasoning skills

Course Outcomes

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

CO1 - Infer ideas to attend international standardized test by broadening receptive and productive skills **(K2)**

CO2 - Interpret the types of writing in different state of affairs **(K2)**

CO3 - Develop language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation **(K3)**

CO4 - Identify the rules of grammar in academic discourse settings **(K3)**

CO5 - Extend the skills to compete in various competitive exams like GATE, GRE, CAT, UPSC, etc. **(K2)**

UNIT I - CAREER SKILLS (6 Hrs)

Listening: Listening at specific contexts Speaking: Mock interview (Personal & Telephonic)-Reading: Read and Review – Newspaper – Advertisement – Company Handbooks, and Guidelines (IELTS based) Writing: Essay Writing (TOEFL) Vocabulary: Words at specified context (IELTS).

UNIT II - CORPORATE SKILLS (6 Hrs)

Listening: Listening and replicating Speaking: Team Presentation (Work Place Etiquettes) Reading: Short texts (signs, emoticons – messages) Writing: E-mail writing – Hard skills -Resume' Writing – Job Application Letter – Formal Letter Vocabulary: Glossary (IELTS).

UNIT III - FUNCTIONAL SKILLS (6 Hrs)

Listening: Listening TED Talks – Speaking: Brainstorming &Individual Presentation – Persuasive Communication — Reading: Text Completion (GRE Based) Writing: Expansion of Compound Words Vocabulary: Expansion of vocabulary (IELTS).

UNIT IV - TRANSFERABLE SKILLS (6 Hrs)

Listening: Listening Documentaries and making notes – Speaking: Conversation practice at formal & informal context Reading: Read and transform – Report, memo, notice and advertisement. Writing: Euphemism, Redundancy and Intensifiers Vocabulary: Refinement of vocabulary (IELTS).

UNIT V – APTITUDE (6 Hrs)

Transformational Grammar: Phrases & Clauses, Concord, Conditional Clauses, Voice, Modals. Verbal Ability Enhancement: Letter Series – Coding &Decoding – Sentence Completion (GATE) – Critical Reasoning & Verbal Deduction (GATE) – Syllogism.

Reference Books

1. Tulgan, Bruce. "Bridging the soft skills gap: How to teach the missing basics to today's young talent". John Wiley & Sons, 2015.
2. Cullen, Pauline, Amanda French, and Vanessa Jakeman. "The official Cambridge guide to IELTS for academic & general training".Cambridge, 2014.
3. Ramesh, Gopalaswamy. "The ace of soft skills: attitude, communication and etiquette for success". Pearson Education India, 2010.
4. Sherfield, Robert M. "Cornerstone: Developing Soft Skills". Pearson Education India, 2009.
5. Lougheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.

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2. https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/l3p1
3. https://www.grammarwiz.com/phrases-and-clauses-quiz.html
4. https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/
5. http://www.englishvocabularyexercises.com/general-vocabulary/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
2	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1
4	1	-	-	-	-	-	-	1	-	3	-	1	-	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20ESP468 PROGRAMMING IN JAVA LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

(Common to CSE, ECE, EEE, IT, ICE, MECH,
CIVIL, BME, MECHTRONICS, CCE)

Course Objectives

- To acquire programming skill in core java.
- To learn how to design java program and applications.
- To acquire object oriented skills in java.
- To develop the skill of designing applications.
- To explore database connectivity.

Course Outcomes

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

CO1 - Apply and practice logical formulations to solve simple problems leading to specific applications. **(K3)**
CO2 - Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**
CO3 - Create java applications using exception handling multithread. **(K3)**
CO4 - Build java distributed applications using Collections and IO streams.**(K3)**
CO5 - Develop simple database programs. **(K3)**

List of Exercises

1. Develop simple programs using java technologies and testing tools.
2. Develop a java program that implements class and object.
3. Write a java program to demonstrate inheritance.
4. Develop a simple real life application program to illustrate the use of Multi Threads.
5. Implement simple applications using Collections.
6. Develop a simple application and use JDBC to connect to a back-end database.
7. Create a student application with Add, Edit, Delete, Show functions using JDBC.
8. Create a Bill Application to store sales details using JDBC.
9. Create java applications using Exception Handling for error handling.
10. Develop a java program that implements the Packages.

Reference Books

1. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
2. Paul Deitel Harvey Deitel, "JAVA How to program (Early Objects)",19th Edition, 2011
3. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Vol 2, Advanced Features, Pearson Education, Seventh Edition, 2010.
4. Herbert Schil dt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.
5. E. Balaguruswamy, "Programming with Java", TMH, 2nd Edition, 2005.

Web References

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog
5. https://www.geeksforgeeks.org

CO-POs/PSOs Mapping

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3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSP404	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To learn and understand DDL & DML
- To learn and understand DCL.
- To implement Basic SQL commands.
- To execute PL/SQL programs.
- To develop GUI applications in any platform.

Course Outcomes

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

CO1 - Implement DDL and DML commands.**(K3)**

CO2 - Implement DCL commands. **(K3)**

CO3 - Analyze PL/SQL programs. **(K3)**

CO4 - Understand PL/SQL programs. **(K3)**

CO5 - Develop GUI applications in their known platform. **(K3)**

List of Exercises

1. Create Table using Data Definition Language (DDL).
2. Modify Table using Data Manipulation Language (DML).
3. Store and Retrieve data through Data Control Language (DCL).
4. Implement Constraints and Built-in functions in various tables.
5. Perform Joins and Group-by functions.
6. Implement Simple Programs in SQL.
7. Create SQL programs using functions.
8. Create SQL programs using procedures.
9. Create SQL programs using triggers.
10. Developing GUI applications.
    - Student Information System.
    - Inventory Management.
    - Payroll Processing.

Reference Books

1. RamezElmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, Pearson Education, 7th Edition, 2016.
2. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, McGraw Hill, 3rd Edition, 2014.
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts", McGraw-Hill Indian Edition, 7th Edition, 2013.
4. Kuhn,"RMAN Recipes for Oracle Database", Apress,2nd Edition, 2013.
5. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System, Pearson Education, 8th Edition, 2006.

Web References

1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. http://dev.mysql.com/doc/
3. http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf

COs/POs/PSOs Mapping

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3	3	3	3	3	2	2	2	-	2	1	-	-	3	2	3
4	3	2	3	3	2	2	1	-	2	1	-	-	3	3	3
5	3	3	3	3	2	2	2	-	2	1	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High.

U20CSP405	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY (Common to CSE and CCE)	L	T	P	C	Hrs
		0	0	2	1	30

Course objectives

- To introduce the basic concepts of various algorithm design techniques.
- Solving various real time problems using Greedy methods.
- To implement real time problems using Analyze dynamic programming
- Experimental with different algorithm techniques like Backtracking and Branch and Bound
- To analyze algorithm for time and space complexity.

Course Outcomes

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

CO1 - Demonstrate various algorithm design techniques used to solve real time problems**(K2)**
CO2 - Analyze the algorithm efficiency in terms of time and space complexity.**(K3)**
CO3 - Solve the real time problems using Divide and Conquer, and Greedy paradigms and derives the time complexity. **(K3)**
CO4 - Determine the Dynamic programming, Backtracking paradigms and explain when an algorithmic design situation calls for it. **(K3)**
CO5 - Interpret the Branch and Bound and NP-Hard paradigms and explain when an algorithmic design situation calls for it. **(K2)**

List of Exercises

1. Implementation of binary search using Divide-and-Conquer technique.
2. Implementation of Finding Maximum and Minimum using Divide-and-Conquer technique.
3. Implementation of Knapsack using Greedy technique.
4. Implementation of Minimum Spanning Tree using Prim's and Kruskal's Algorithm using Greedy technique.
5. Implementation of Single-Source Shortest Paths algorithms using Greedy technique.
6. Implementation of Multi-Stage Graphs using Dynamic Programming technique.
7. Implementation of All Pairs Shortest Paths using Dynamic Programming technique.
8. Implementation of Traveling Salesman algorithms using Dynamic Programming technique.
9. Implementation of 8 Queens with the design of Backtracking.
10. Implementation of sum of subsets with the design of Backtracking.
11. Implementation of 0/1 Knapsack problems with Branch-and-Bound technique.
12. Implementation of Traveling Salesman problems with Branch-and-Bound technique.

Text Books

1. Faruqi A,"Design and Analysis of Algorithms", CBS Publishers, 2016.
2. S Sridhar," Design and Analysis of Algorithms First Edition", Oxford University Press,1st Edition, 2015.
3. Dave,"Desgin and Analysis of Algorithms", Pearson Education India, 2nd Edition, 2013.

References Books

1. Levitin Anany," Introduction to the Design and Analysis of Algorithms", Pearson Education India,1st Edition, 2019.
2. Aho Alfred V.,"Design & Analysis of Computer Algorithms", Pearson Education India,2nd Edition,2018
3. Basu S. K.," Design Methods and Analysis of Algorithms", PHI Learning,3rd Edition, 2018.
4. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", 2nd Edition, Galgotia Publications, 2010.
5. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms, 3rd Edition, PHI/Pearson Education, 2009.

Web References

1. https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial
2. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
3. https://swayam.gov.in/nd1_noc20_cs71/preview
4. https://swayam.gov.in/nd1_noc20_cs93/preview.

		L	T	P	C	Hrs
U20CSP405	**DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY** (Common to CSE and CCE)	**0**	**0**	**2**	**1**	**30**

Course objectives

- To introduce the basic concepts of various algorithm design techniques.
- Solving various real time problems using Greedy methods.
- To implement real time problems using Analyze dynamic programming
- Experimental with different algorithm techniques like Backtracking and Branch and Bound
- To analyze algorithm for time and space complexity.

Course Outcomes

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

CO1 - Demonstrate various algorithm design techniques used to solve real time problems**(K2)**
CO2 - Analyze the algorithm efficiency in terms of time and space complexity.**(K3)**
CO3 - Solve the real time problems using Divide and Conquer, and Greedy paradigms and derives the time complexity. **(K3)**
CO4 - Determine the Dynamic programming, Backtracking paradigms and explain when an algorithmic design situation calls for it. **(K3)**
CO5 - Interpret the Branch and Bound and NP-Hard paradigms and explain when an algorithmic design situation calls for it. **(K2)**

List of Exercises

1. Implementation of binary search using Divide-and-Conquer technique.
2. Implementation of Finding Maximum and Minimum using Divide-and-Conquer technique.
3. Implementation of Knapsack using Greedy technique.
4. Implementation of Minimum Spanning Tree using Prim's and Kruskal's Algorithm using Greedy technique.
5. Implementation of Single-Source Shortest Paths algorithms using Greedy technique.
6. Implementation of Multi-Stage Graphs using Dynamic Programming technique.
7. Implementation of All Pairs Shortest Paths using Dynamic Programming technique.
8. Implementation of Traveling Salesman algorithms using Dynamic Programming technique.
9. Implementation of 8 Queens with the design of Backtracking.
10. Implementation of sum of subsets with the design of Backtracking.
11. Implementation of 0/1 Knapsack problems with Branch-and-Bound technique.
12. Implementation of Traveling Salesman problems with Branch-and-Bound technique.

Text Books

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2. S Sridhar," Design and Analysis of Algorithms First Edition", Oxford University Press,1st Edition, 2015.
3. Dave,"Desgin and Analysis of Algorithms", Pearson Education India, 2nd Edition, 2013.

References Books

1. Levitin Anany," Introduction to the Design and Analysis of Algorithms", Pearson Education India,1st Edition, 2019.
2. Aho Alfred V.,"Design & Analysis of Computer Algorithms", Pearson Education India,2nd Edition,2018
3. Basu S. K.," Design Methods and Analysis of Algorithms", PHI Learning,3rd Edition, 2018.
4. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", 2nd Edition, Galgotia Publications, 2010.
5. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms, 3rd Edition, PHI/Pearson Education, 2009.

Web References

1. https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial
2. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
3. https://swayam.gov.in/nd1_noc20_cs71/preview
4. https://swayam.gov.in/nd1_noc20_cs93/preview.

		L	T	P	C	Hrs
U20CSC4XX	**CERTIFICATION COURSES**	0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

U20CSS403 EXPLORING PHOTOSHOP

L	T	P	C	Hrs
0	0	2	0	30

Course Objectives

- To understand about the basic Photoshop files and tools
- Explore Photoshop Help, and use it to find out more about the tools in the Toolbox.
- Create a layered Photoshop document from a image
- Create images that demonstrate advanced selection and layering techniques.
- Create a theme based image using Photoshop tools.

Course Outcomes

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

CO1 - Identify elements of the Photoshop user interface and demonstrate knowledge of their functions.

CO2 - Demonstrate knowledge of layers and images

CO3 - Apply painted masks, selection-based masks, gradient masks, and blend modes to create sophisticated image effects.

CO4 - Create adjustment layers for editable, non-destructive changes to image coloration and exposure.

CO5 - Apply special effects to Zooming using masks, paths, and layer styles.

List of Exercises

1. Study of Photoshop files and tools
2. Create a Visiting Card by using appropriate tools in Photoshop.
3. Design a photo frame using custom shapes in Photoshop
4. Convert a color photo to black and white photo
5. Explain the steps for Designing a Passport Size Photo on a Max Size Paper
6. Removing White Background On Logo And Turn Into Transparent Image
7. Zooming Effect in picture
8. Panorama
9. Mass Image Editing Using Photoshop Actions
10. Create a Banner

Reference Books

1. Lisa Fridsma, Brie Gyncild,"Adobe After Effects Classroom in a book", Adobe Press, 2020.
2. Andrew Faulkner, Conrad Chavez," Adobe Photoshop CC", Adobe Press, 2016.
3. Conrad Chavez,"Color Management for Photographers and Designers," Peach Pit, 2014.
4. Elaine Weinmann, Peter Lourekas, "Photoshop CC: Visual QuickStart Guide ",Peachpit press,2014.
5. Derek Lea ,"Creative Photoshop:Digital Illustration and art techniques", Focal Press,2012.

Web References

1. https://nptel.ac.in/content/storage2/courses/112101002/downloads/Lec_41-42.pdf
2. https://nptel.ac.in/courses/106/106/106106177/
3. http://www.nptelvideos.com/adobe/adobe_photoshop_tutorials.php
4. https://www.adobe.com/products/captivateprime/content-catalog/creative-cloud/photoshop-cc.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	1	-	-	-	2	-	-	2	1	-	-
2	-	-	-	-	3	-	-	-	-	3	-	2	1	-	-
3	-	-	-	-	3	-	-	-	-	3	-	2	1	-	-
4	2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
5	3	3	1	-	-	2	3	-	3	2	3	3	3	3	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSS403 **APTITUDE - II**

L	T	P	C	Hrs
0	0	2	0	30

Course Contents

- Number System – II [Advanced Level].
- Factors [Sum, Product, odd, Even].
- Remainder Theorem - No of Zeros at End -Highest Power - Finding the Last two Digits.
- Time & Work, Chain Rule - Working Together.
- Combination Method - Before, After & Alternative Method.
- Men & Days - Men, Days & Work - Efficiency & Wages.
- Equation Method.
- Profit & Loss - Basics & Short Cuts - Passing Through Successive Hands.
- Purchase & Selling - Dishonest Shopkeeper.
- Successive Discount into Single Equivalent Discount - Dealing with two or more Parts.
- Percentage - Conversion & Shortcuts - Population, Depreciation Methods.
- Percentage Savings & Expenditure - Reduction in Consumption - Percentage Relationship.
- Time, Speed & Distance, Trains, Boats - Relationship between T/S/D.
- Train in same Direction - Opposite Direction.
- Boats along with Streams - Against the Streams.

U20CSS42	OFFICE AUTOMATION	L	T	P	C	Hrs
		0	0	2	0	30

MS OFFICE

Introduction to MS Office - MS Word and Open Office – Writer: MS Word - Working with Documents -Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help, **Formatting Documents -** Setting Font styles, Font selection- style, size, colour etc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering. **Setting Page style -** Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes – Shortcut Keys; Inserting manual page break, Column break and line break, Creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page.

TABLES AND DRAWING TOOLS

Creating Tables- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, **Drawing** - Inserting ClipArts, Pictures/Files etc., **Tools** – Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature. Printing Documents – Shortcut keys.

MS POWERPOINT

MS Power point: Introduction to presentation – Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts. **Creating a presentation** - Setting Presentation style, Adding text to the Presentation. Formatting a Presentation - Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw. **Adding Effects to the Presentation**- Setting Animation & transition effect. **Printing Handouts,** Generating Standalone Presentation viewer.

MS EXCEL

MS Excel: Spread Sheet & its Applications, Opening Spreadsheet, Menus - main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types. Working with Spreadsheets- opening, Saving files, setting Margins, Converting files to different formats (importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys. **Entering & Deleting Data-** Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc, Inserting Functions, Manual breaks, **Setting Formula** - finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae.

MS ACCESS

MS Access: Introduction, Planning a Database, Starting Access, Access Screen, Creating a New Database, Creating Tables, Working with Forms, Creating queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing & Print Preview – Importing data from other databases viz. MS Excel etc.

References Books

1. Working in Microsoft Office – Richard Mansfield – Tata McGraw Hill Education.
2. Professional Office Procedure by Susan H Cooperman, Printice Hall
3. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
4. Technology And Procedures for Administrative Professionals by Patsy Fulton-Calkins, Thomson Learning
5. Microsoft Office 2010 For Dummies By Wallace Wang
6. 2007 Microsoft Office System Plain & Simple by Jerry Joyce Microsoft Press
7. Office XP : The Complete Reference- Stephen L. Selson – Tata McGraw Hill Education.

Web References

1. http://office.microsoft.com/en-us/training/CR010047968.aspx
2. https://gsuite.google.com/learning-center
3. http://spoken-tutorial.org

		L	T	P	C	Hrs
U20CSM404	**NSS**	0	0	2	0	30

Course Content

NCC/NSS training is compulsory for all the Undergraduate students

1. The above activities will include Practical/field activities/Extension lectures.

2. The above activities shall be carried out outside class hours.

3. In the above activities, the student participation shall be for a minimum period of 45 hours.

4. The above activities will be monitored by the respective faculty incharge and the First Year Coordinator.

5. Pass /Fail will be determined on the basis of participation, attendance, performance and behaviour. If a candidate Fails, he/she has to repeat the course in the subsequent years

6. Pass in this course is mandatory for the award of degree.

PROFESSIONAL ELECTIVES

U20CSE401	DATABASE ADMINISTRATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To Learn Installing Oracle Software and create database.
- To study the SQL commands.
- To understand the memory structure and background process.
- To explore Database maintenance and monitoring process.
- To extract backup and recovery process.

Course Outcomes

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

CO1 - Install Oracle software and create the Oracle Database. **(K2)**
CO2 - Build queries using the SQL commands. **(K2)**
CO3 - Define and manage user access and security. **(K2)**
CO4 - Manage the storage structures. **(K3)**
CO5 - Design Database backup and recovery procedures. **(K3)**

UNIT I INTRODUCTION TO SQL *PLUS (9 Hrs)

Introduction: DBMS architecture and data independence – DBA roles and responsibilities – SQL *PLUS Overview: SQL Plus Fundamentals – Producing more readable outputs – Accepting values at runtime Using iSQL *Plus.

UNIT II DML STATEMENTS, CONSTRAINTS AND VIEWS (9 Hrs)

Introduction to DML Statements: Truncating a table – Transaction control language – Managing Constraints: Creating constraints – Dropping constraints – Enabling and disabling constraints – Defining Constraints Checks. Managing Views: Creating and modifying views – Using views – Inserting – Updating and deleting data through views.

UNIT III USER ACCESS AND SECURITY (9 Hrs)

Creating and modifying user accounts – Creating and using roles – Granting and revoking privileges – Managing user groups with profiles – Oracle Overview and Architecture: An overview of logical an physical storage structures – Oracle memory structures – Oracle background processes – Connecting to oracle instance – Processing SQL command.

UNIT IV MANAGING ORACLE (9 Hrs)

Starting up the oracle instance – managing sessions – shutting down the oracle instance – instances messages and instance alerts. Control and Redo Log Files: Managing the control files – Maintaining and monitoring redo log files. Managing Users and Security: Profiles – Managing users – managing privileges – managing roles – querying role information.

UNIT V INTRODUCTION TO NETWORK ADMINISTRATION (9 Hrs)

Network design considerations – Network responsibilities for the DBA – Network configuration – Overview of oracle Net features – Oracle Net Stack Architecture – Backup and Recovery Overview: Database backup – Restoration and recovery – Types of failure in oracle environment – Defining a backup and recovery strategy – Testing the backup and recovery plan.

Text Books

1. Craig S. Mullins, "Database Administration: The Complete Guide to DBA Practices and Procedures", 2012.
2. Chip Dawes, Biju Thomas, "Introduction to Oracle 9i SQL", BPB Publications, 2006.
3. C.J. Date, "Database Systems", Addison Wesley, 8th Edition, 2004.

Reference Books

1. Susan Lawson, "DB2 11 for z/OS Database Administration", 2016.
2. Bob Bryla, Biju Thomas, "Oracle 9i DBA Fundamental I", BPB Publications, 2006.
3. Donald K. Burleson, "Physical Database Design Using Oracle", 2004.
4. Doug Stums, Matthew Weshan, "Oracle 9i DBA Fundamental I", BPB, 2002.
5. Joseph C. Johnson, "Oracle 9i Performance Tuning", BPB, 2002.

Web References

1. https://www.udemy.com/course/ibm-db2-9-sql-and-database-administration-workshop/
2. https://www.tutorialspoint.com/listtutorials/oracle/dba-concepts/1
3. https://www.datacamp.com/courses/data-engineering-for-everyone
4. https://www.pluralsight.com/browse/it-ops/database-administration?
5. https://education.oracle.com/mysql/mysql-database-administration/product_159

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	2	1	2	3	1	2	1	3	2	2
2	3	3	2	2	2	2	1	2	3	3	2	1	2	3	2
3	3	3	2	-	2	-	1	2	3	1	2	1	3	2	2
4	3	2	2	3	2	2	1	2	2	2	2	2	2	1	2
5	2	2	1	2	3	3	1	1	2	2	1	3	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSE402	**E - BUSINESS**	3	0	0	3	45

Course Objectives

- To explore both the technical and business related implications of electronically medicated commerce.
- To enable the students to trace the development of E-Business from its origins in electronic data interchange to its current growing importance.
- To explore the potential of electronic business for future development and the development of the information society.
- To explore the authentication and authorization of online transactions.
- To introduce the strategy, culture, legal methods of establishing websites for business organizations.

Course Outcomes

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

CO1 - Demonstrate advanced knowledge of technical and business strategies related to E-Business and E-Commerce. **(K2)**

CO2 - Describe about the available secure electronic protocols. **(K3)**

CO3 - Identify the security issues and provide appropriate solutions to overcome. **(K3)**

CO4 - Evaluate Mobile Business and related technologies. **(K3)**

CO5 - Discuss contemporary technologies for globally distributed teams. **(K3)**

UNIT I ELECTRONIC COMMERCE ENVIRONMENT AND OPPORTUNITIES (9 Hrs)

Background – The Electronic commerce environment – Electronic marketplace technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to open EDI – Electronic commerce with WWW / Internet – Commerce net advocacy – Web commerce going forward.

UNIT II APPROACHES TO SAFE ELECTRONIC COMMERCE (9 Hrs)

Overview – Secure Transport Protocols – Secure transactions – Secure Electronic Payment Protocol (SEPP) – Secure Electronic Transaction (SET) – Certificates for authentication – Security on Web Servers and enterprise networks – Electronic cash and electronic payment schemes: Internet Monetary payment and security requirements – Payment and purchase order process - Online electronic cash.

UNIT III INTERNET / INTRANET SECURITY ISSUES AND SOLUTIONS (9 Hrs)

The need for computer security – Specific intruder approaches – Security strategies – Security tools – Encryption – Enterprise networking and Access to the Internet – Antivirus programs – Security Teams.

UNIT IV MASTERCARD/VISA SECURE ELECTRONIC TRANSACTION (9 Hrs)

Introduction – Business requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of email. MIME: Multipurpose Internet Mail Extensions. S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services.

UNIT V INTERNET AND WEBSITE ESTABLISHMENT (9 Hrs)

Introduction – Technologies for web servers – Internet tools relevant to commerce – Internet applications for commerce – Internet charges – Internet access and architecture – Searching the Internet – Case study.

Text Books

1. Daniel Minoli and Emma Minoli, "Web Commerce Technology Handbook", Tata McGraw-Hill, 2017.
2. Elias M. Awad , "Electronic Commerce from Vision to Fulfillment", PHI, Feb-2003.
3. Bharat Bhaskar, "Electronic Commerce – Framework, Technology and Application", TMH, 2003.

Reference Books

1. Bruce C. Brown, "How to Use the Internet to Advertise, Promote and Market Your Business or Website with Little or No Money", Atlantic Publishing Company, 2nd Edition, 2011.
2. Andrew B. Whinston, Ravi Kalakota, K. Bajaj and D. Nag, "Frontiers of Electronic Commerce", Tata McGraw-Hill, 2004.
3. Kamalesh K. Bajaj, "E-Commerce: The Cutting Edge & Business", Tata McGraw-Hill, 2003.
4. Brenda Kennan, "Managing your E-Commerce Business", PHI, 2001.
5. Jim A Carter, "Developing E-Commerce Systems", PHI, 2001.

Web References

1. https://nptel.ac.in/courses/110/105/110105083/
2. https://www.tutorialspoint.com/listtutorial/INTRODUCTION-TO-E-BUSINESS/6549.
3. https://en.wikipedia.org/wiki/Electronic_business

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	1	1	3
2	2	1	3	3	-	3	-	-	-	-	-	-	1	1	3
3	2	2	3	-	2	3	-	1	-	-	-	-	1	1	3
4	2	2	3	-	2	2	-	-	-	-	-	-	1	1	3
5	2	1	1	1	-	3	-	-	-	-	-	-	1	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE403	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand objects, classes and inheritance.
- To learn the utilization of software objects to build software projects.
- To use UML in requirements elicitation and designing.
- To gain knowledge in the concepts of relationships and aggregations.
- To extract Object Oriented Analysis Processes.

Course Outcomes

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

CO1 - Analyze, design and document the requirements through use case driven approach. **(K4)**
CO2 - Categorize the different object oriented methodologies. **(K3)**
CO3 - Develop and Explore the Classes and Its Relationships. **(K4)**
CO4 - Apply the concepts of architectural design for view layer and access layer. **(K3)**
CO5 - Test for the software quality using different testing strategies. **(K4)**

UNIT I AN OVERVIEW OF OBJECT ORIENTED SYSTEM DEVELOPMENT (9 Hrs)

Introduction – Object Oriented System Development Methodology – Why object orientation – Overview of Unified Approach – Object Basics: Object oriented philosophy – Objects – Classes – Attributes – Object behavior and methods – Encapsulation and Information Hiding – Class hierarchy – Polymorphism – Object Relationships and Associations – Aggregations and Object Containment – Object Identity – Static and Dynamic Binding – Persistence. Object oriented systems development life cycle: Software development process – Building high quality software – Use case driven approach - Reusability.

UNIT II OBJECT ORIENTED METHODOLOGIES (9 Hrs)

Rumbaugh et al.'s Object modeling technique – Booch methodology – Jacobson et al. Methodologies – Patterns – Framework – Unified approach – Unified modeling language: Static and Dynamic Model – UML Diagrams – UML class diagram – UML use case diagram - UML dynamic modeling – UML extensibility – UML meta model.

UNIT III OBJECT ORIENTED ANALYSIS (9 Hrs)

Business object analysis – Use case driven object oriented analysis – Business process modeling – Use Case model - Developing Effective Documentation – Object Analysis Classification: Classification Theory – Noun Phrase Approach – Common Class Patterns Approach – Use Case Driven Approach – Classes Responsibilities and Collaborators – Naming Classes – Identifying Object Relationships – Attributes and Methods: Association – Super-Subclass Relationship – IS - A Relationship.

UNIT IV OBJECT ORIENTED DESIGN (9 Hrs)

Object Oriented Design Process – Object Oriented Design Axioms – Corollaries – Designing Classes: Object constraint language – Process of designing class – Class visibility – Refining attributes – Access Layer: Object store and Persistence – Database management system – Logical and Physical database-Organization and Access Control – Distributed Databases and Client Server Computing – Object Oriented Database Management System – Object Relational Systems – Designing Access Layer Classes – View Layer: Designing View Layer Classes – Macro Level Process – Micro Level Process – Purpose of View Layer Interface – Prototyping the user interface.

UNIT V SOFTWARE QUALITY (9 Hrs)

Software Quality Assurance: Quality Assurance Test – Testing strategies – Impact of object oriented testing – Test cases – Test Plan – Myers debugging principle. System usability and measuring user satisfaction: Usability testing – User satisfaction testing.

Text Books

1. John Deacon, "Object Oriented Analysis and Design", Addison Wesley, 1st Edition, 2012.
2. Grady Booch, James Rumbaugh, and Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley, 3rd Edition , 2011.
3. Ali Bahrami, "Object oriented systems development using the unified modeling language", McGraw-Hill, 1st Edition, 2008.

Reference Books

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Developmentll", Pearson Education, Third Edition, 2005.
2. Mike O'Docherty, "Object-Oriented Analysis & Design: Understanding System Development with UML 2.0", John Wiley & Sons, 2005.
3. Bernd Oestereich, "Developing Software with UML, Object - Oriented Analysis and Design in Practice", Addison-Wesley, 2nd Edition 2004.
4. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.
5. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.

Web References

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2. http://www.ibm.com/developerworks/rational/products/rose/
3. http://www.smartdraw.com/resources/tutorials/jacobson-oose-diagrams/
4. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
5. https://www.uml-diagrams.org/
6. https://nptel.ac.in/courses/106/105/106105153/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	3	2	3	2	3	0	1	2	2	2	2	2	3
2	3	2	3	1	3	2	2	0	2	3	1	2	2	2	3
3	3	2	2	1	2	1	2	0	1	1	1	2	2	1	3
4	3	2	3	3	3	1	2	0	2	1	2	2	2	2	3
5	3	3	3	2	2	1	2	0	2	3	3	3	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20CSE404 SCRIPTING LANGUAGES

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- Creation of programs in the Linux environment
- Create and run scripts using Perl
- Create and run scripts using TCL
- Gain Knowledge about the scripting languages such as PERL, TCL/TK
- Create and run scripts using Python

Course Outcomes

After completion of the course, the students will be able to
CO1 - Illustrate the basic concepts of Linux Administration. **(K2)**
CO2 - Explore the concepts of Perl **(K5)**
CO3 - Explore the concepts of TCL **(K5)**
CO4 - Understand the basic fundamentals of TK **(K2)**
CO5 - Working with programing concepts of Python **(K1)**

UNIT I INTRODUCTION TO LINUX (9 Hrs)

Introduction to Linux – File system of the Linux – General usage of Linux kernel & basic commands – Linux users and group – Permissions for file – directory and users – Searching a file & directory – zipping and unzipping concepts.

UNIT II INTRODUCTION TO PERL (9 Hrs)

Introduction to Perl Scripting, working with Simple Values – Lists and Hashes – Loops and Decisions – Regular Expressions, Files and Data in Perl Scripting.

UNIT III TCL FUNDAMENTALS (9 Hrs)

TCL Fundamentals – String and Pattern Matching – TCL Data Structures – Control Flow Commands.

UNIT IV WORKING OF TCL/TK COMMANDS (9 Hrs)

Introduction to TCLTK – Tk Fundamentals – String processing – functions and Regular Expressions – Arrays – Files – Tk by Examples

UNIT V PYTHON PROGRAMMING (9 Hrs)

Introduction to Python – History of Python – Features of Python – Simple Program in Python – Commenting in Python – Quotations in Python – Lines and Indentation – Multi-Line Statements – Input Operations – Output Operations.

Text Books

1. Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, Inc., 2010.
2. David Barron, "The World of Scripting Languages", 1st Edition, Wiley publications, 2009.
3. Brent Welch, Ken Jones, "Practical Programming in Tcl and Tk", Pearson; 4th Edition, 2003.

Reference Books

1. Randal L. Schwartz, "Learning Perl: Making Easy Things Easy and Hard Things Possible O'Reilly Publication", 7th Edition, 2016.
2. Daniel J. Barrett," Linux", 3rd Edition, O'Reilly Media, 2016.
3. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", O'Reilly Publication, 5th Edition, 2013.
4. Morgan Kaufmann, Clif Flynt, "Tcl/Tk: A Developer's Guide", 3rd Edition", 2012.
5. Paul Raines, Jeff Tranter, "Tcl/Tk in a Nutshell", O'Reilly Media, 1999.

Web References

1. http://www.bin-co.com/perl/perl_tk_tutorial/
2. https://www.tutorialspoint.com/tcl-tk/index.html
3. https://docs.python.org/3/tutorial/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	3	2	-	1	-	-	-	-	-	-	-	-	-
3	2	2	3	-	2	1	-	1	-	-	-	-	-	-	-
4	2	2	3	-	2	2	-	-	-	-	-	-	-	-	-
5	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSE405	**FUNDAMENTALS OF PROGRAMMING LANGUAGES**	3	0	0	3	45

Course Objectives

- To Describe and classify various programming languages and data types.
- To summarize the sequence control.
- To Generalize various object oriented programming paradigms.
- To Discuss about Logical and functional programming.
- To summarize the concept of concurrent programming.

Course Outcomes

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

CO1 - To understand various programming and data types **(k2)**
CO2 - Apply various sequence control techniques of programming languages. **(k2)**
CO3 - To understand the object oriented programming. **(k2)**
CO4 - To analyse logical and functional programming. **(k3)**
CO5 - To understand about concurrent programming. **(k2)**

UNIT I INTRODUCTION (9 Hrs)

Introduction: Role of programming languages – Need to study programming languages – Characteristics of a good programming languages – Introduction to various programming paradigms: Procedural – Object-oriented – Logic and functional – Concurrent programming. Data Types: Properties of structured and non-structured data types and Objects – Variables – Constants – Derived and abstract data types – Declaration – Type checking. Binding and binding times – Type conversion – Scalar data type – Composite data types – Implementation and Storage representation of data types and control flow statement.

UNIT II SEQUENCE CONTROL (9 Hrs)

Sequence Control: Implicit and explicit sequence control – Sequencing with arithmetic and non-arithmetic expressions – Sequence control between statements. Subprograms control: Subprogram sequence control – Attributes of data control – Shared data in.

UNIT III OBJECT ORIENTED PROGRAMMING (9 Hrs)

Object Oriented Programming: The class declarations – Constructors – Information hiding and data abstraction using classes – Access specification – Inheritance – Polymorphism – Parameterized types – Exception handling.

UNIT IV LOGICAL AND FUNCTIONAL PROGRAMMING (9 Hrs)

Logic Programming: Logic programming language model – Logical statements – Resolution – unification – search structures: backward and forward – Applications of logic programming – PROLOG. Functional Programming: Features of functional languages – LISP – Applications of functional and logic programming languages.

UNIT V CONCURRENT PROGRAMMING (9 Hrs)

Basic concepts of Concurrent Programming: processes – Synchronization primitives – Safety and liveness properties – Parallelism in Hardware – Streams – Concurrency as interleaving – Safe access to shared data.

Text Books

1. Richard Fairley," Software Engineering Concepts", Tata Macgraw Hill, 2006.
2. Sethi R., "Programming Languages concepts & constructs", 2nd Edition, Pearson Education, 2006.
3. Terrance W. Pratt, and Marvin V. Zelkowitz, "Programming Languages, Design and Implementation", Prentice-Hall of India, Fourth Edition, 2002.

Reference Books

1. Ghezzi C, Milano P., Jazayeri M., "Programming Languages Concepts", Pearson, 11th Edition, 2016
2. Scbesta R., "Concepts of Programming Languages", Pearson Education, 10th Edition, 2013.
3. Roosta S., "Foundations of Programming Languages", Cengage, 1st Edition, 2009.
4. M. Ben Ari, "Principles of Concurrent and Distributed Programming, Pearson, 2nd Edition, 2005.
5. Robert W. Sebesta, "Concepts of Programming Languages", Addison Wesley, Sixth Edition, 2003.

Web References

1. www,nptel.ac.in/Fundamentals of Programming Language.
2. https://www.edx.org/learn/computer-programming.
3. https://www.classcentral.com/course/programming1-385.
4. www.greeksforgreeks.org/Fundamentals of Programming Language.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	2	2	2	-	-	3	-	3	2	3	2
2	3	3	3	2	3	2	2	-	-	-	-	3	3	3	2
3	3	3	3	2	3	2	2	-	-	2	-	3	3	3	3
4	2	2	2	2	2	2	2	-	-	2	-	2	2	2	2
5	3	3	2	2	2	2	2	-	2	3	3	3	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

OPEN
ELECTIVES

U20EEO402

ELECTRICAL SAFETY

(Common to ECE, ICE, MECH, CIVIL, Mechatronics,
CCE, BME, IT, CSE, FT)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To familiarize the Indian Electricity Rules and Act related with electrical safety.
- To provide a knowledge about electrical shocks and safety precautions.
- To create awareness of the electrical safety associated with installation of electrical equipment.
- To analyze different Hazardous areas for electrical safety.
- To expose knowledge about necessity of safety policy and safety management.

Course Outcomes

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

CO1 - Describe the Indian Electricity (IE) acts and various rules for electrical safety. **(K2)**

CO2 - Expose safety measures to prevent electrical shock in handling of domestic electrical appliances. **(K3)**

CO3 - Evaluate the safety aspects during installation of plant and equipment. **(K3)**

CO4 - Describe the various hazardous area and application of electrical safety in various places. **(K3)**

CO5 - Acquire knowledge about importance of electrical safety training to improve quality management in electrical systems. **(K3)**

UNIT I CONCEPTS AND STATUTORY REQUIREMENTS (9 Hrs)

Objective and scope of electrical safety - National electrical Safety code - Statutory requirements – Indian Electricity acts related to electrical Safety - Safety electrical one line diagram - International standards on electrical safety safe limits of current and voltage - Grounding of electrical equipment of low voltage and high voltage systems - Safety policy - Electrical safety certificate requirement

UNITII ELECTRICAL SHOCKS AND THEIR PREVENTION (9 Hrs)

Primary and secondary electrical shocks - Possibilities of getting electrical shock and its severity - Effect of electrical shock of human being - Shocks due to flash/ Spark over's - Firing shock - Multi storied building - Prevention of shocks - Safety precautions - Safe guards for operators - Do's and Don'ts for safety in the use of domestic electrical appliances - Case studies on electrical causes of fire and explosion

UNIT III SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE (9 Hrs)

Need for inspection and maintenance - Preliminary preparations - Field quality and safety - Personal protective equipment - Safe guards for operators - Safety equipment - Risks during installation of electrical plant and equipment - Effect of lightning current on installation and buildings - Safety aspects during installation -Safety during installation of electrical rotating machines - Importance of earthing in installation– Agricultural pump installation

UNIT IV HAZARDOUS ZONES (9 Hrs)

Primary and secondary hazards - Hazardous area classification and of electrical equipments (IS, NFPA, API and OSHA standards) - Explosive gas area classifications: Class I(Division 1) - Zone 0, Zone 1, zone 2 classified locations, Design Philosophy for Equipment and installations-Classification of equipment enclosure for various hazardous gases and vapors - flash hazard calculation and approach distances- calculating the required level of arc protection

UNIT V SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS (9 Hrs)

Principles of Safety Management - Occupational safety and health administration standards - Safety organization - Safety auditing - Employee electrical safety teams - Electrical safety training to improve Quality management - Total quality control and management – Importance of high load factor - Causes of low power factor - Disadvantages of low power factor - Power factor improvement - Importance of P.F. improvement - Case studies of electrical workplace safety practices.

Text books

1. John Cadick, Mary CapelliSchellpfeffer, Dennis Neitzel, Al Winfield, "Electrical Safety Handbook", McGraw-Hill Education, 4th Edition, 2012.
2. Madden, M. John, "Electrical Safety and the Law: A Guide to Compliance", Wiley publications, 4th Edition, 2002.
3. Mohamed A. El-Sharkawi, "Electric Safety: Practice and Standards", CRC Press; 1st Edition, 2013.

Reference books

1. Rob Zachariason, "Electrical Safety", Delmar Cengage Learning, 1st Edition, 2011.
2. Peter E. Sutherland, "Principles of Electrical Safety", Wiley-IEEE Press; 1st Edition, 2014.

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1. https://www.apeasternpower.com/downloads/elecact2003.pdf
2. https://safetyculture.com/topics/electrical-hazards/
3. https://www.jove.com/science-education/10114/electrical-safety-precautions-and-basic-equipment
4. https://electrical-engineering-portal.com/21-safety-rules-for-working-with-electrical-equipment
5. https://www.electrical4u.com/safety-precautions-for-electrical-system/
6. https://www.constellation.com/energy-101/electrical-safety-tips.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
2	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
3	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
4	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-
5	3	3	3	3	2	-	3	-	-	-	-	3	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20ECO402	**CONSUMER ELECTRONICS** (Common to EEE, ICE, CSE MECH, IT, CIVIL, CCE, BME, Mechatronics, FT)	3	0	0	3	45

Course Objectives

- To enable thetroubleshoot of different types of microphones and loudspeakers
- To make the students to analyse the working of digital console, digital FM tuner and troubleshoot audio systems
- To train to test the working of various colour TV
- To empower them to troubleshoot colour TV receivers
- To equip them to maintain various electronic home and office appliances

Course Outcomes

After completion of the course, students will be able to

CO1 -Describe the fundamental audio characteristics and measurements, operating principles of microphone and loudspeaker (K1)

CO2 -Explain the working of digital console, digital FM tuner and troubleshoot the audio systems (K2)

CO3 -Distinguish the salient features of colour TV and Monochrome and troubleshoot TV camera (K2)

CO4 -Demonstrate various interfaces in digital TV, the working of DTH receiver, CD/DVD players (K3)

CO5 -Explain the working of FAX, Microwave oven, Washing machine, Air conditioner, Refrigerators and camera (K2)

UNIT I AUDIO FUNDAMENTALS AND DEVICES (9Hrs)

Basic characteristics of sound signal, Microphone- working principle, sensitivity, nature of response. Types of Microphone, Loud speaker- working principle, Woofers and Tweeters, characteristics.Types of Loudspeaker. Sound recording

UNITII AUDIO SYSTEMS (9Hrs)

Introduction to audio system, Digital Console- Block diagram, working principle,applications, FM tuner-concepts of digital tuning, ICs used in FM tuner TD702IT, PA address system- Planning, speaker impedance matching, characteristics, Power amplifier specification

UNIT III TELEVISION SYSTEMS (9Hrs)

Monochrome TV standards, Components of TV system, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal,Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera.

UNIT IV TELEVISION RECEIVERS AND VIDEO STANDARDS (9Hrs)

Colour TV receiver- block diagram, Digital TVs- LCD, LED , PLASMA, HDTV, 3-D TV, projection TV, DTH receiver, Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI, Digital Video Interface, CD and DVD player: working principles, interfaces

UNIT V HOME AND OFFICE APPLIANCES (9Hrs)

Microwave Oven: Types, technical specifications. Washing Machine: hardware and software. Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices, picture processing, picture storage

Text Books

1. Bali S.P. , 'Consumer Electronics', **copyright 2008**,Pearson Education India.
2. Bali R and Bali S.P. 'Audio video systems : principle practices & troubleshooting', Khanna Book Publishing Co. (P) Ltd
3. Gulati R.R., 'Modern Television practices', 5th edition, 2015, New Age International Publication (P) Ltd.

Reference Books

1. Gupta R.G., 'Audio video systems', 2nd edition,2017, Tata Mcgraw Hill, New Delhi, India
2. Whitaker Jerry & Benson Blair, 'Mastering Digital Television', McGraw-Hill Professional, 2006
3. Whitaker Jerry & Benson Blair, 'Standard handbook of Audio engineering', 2nd edition,2002, McGraw-Hill Professional

Web Resources

1. http://www.scientificamerican.com/article.cfm?id = experts.bluetooth-work
2. http://www.cosc.brocku.ca/Offerings/3P92/seminars/HDTV.ppt
3. http://www.circuitstoday.com/blu-ray-technology-working
4. http://www.freevideolectures.com

COs Mapping with POs and PSOs

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
2	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
3	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
4	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1
5	2	-	2	1	-	1	-	-	-	-	-	-	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

WEB DEVELOPMENT

		L	T	P	C	Hrs
U20CSO401	(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To study the fundamentals of web application development
- To understand the design components and tools using CSS
- To learn the concepts JavaScript and programming fundamentals.
- To study about advance scripting and Ajax applications.
- To understand the working procedure of XML

Course Outcomes

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

CO1 - Develop basic web applications. **(K5)**
CO2 - Design the web applications using CSS. **(K5)**
CO3 - Validate the web pages using javascripts functions. **(K5)**
CO4 - Demonstrate the web 2.0 application to advance scripts. **(K3)**
CO5 - Update the knowledge of XML Data. **(K4)**

UNIT I INTRODUCTION TO WWW & HTML (9 Hrs)

Protocols – Secure Connections – Application and development tools – Web browser – Server definition – Dynamic IP. Web Design: Web site design principles – Planning the site and navigation. HTML: Development process – Html tags and simple HTML forms – Web site structure.

UNIT II STYLE SHEETS (9 Hrs)

Introduction to CSS: Need for CSS – Basic syntax and structure using CSS – Background images – Colors and properties – Manipulating texts using fonts, borders and boxes – Margins, padding lists, positioning using CSS – CSS2.

UNIT III JAVASCRIPTS (9 Hrs)

Client side scripting: Basic JavaScript – Variables – Functions – Conditions – Loops. Applications: Page Validation – Reporting.

UNIT IV ADVANCE SCRIPT (9 Hrs)

JavaScript and objects – DOM and Web browser environments – Forms and Validations – DHTML. AJAX: Introduction – Web applications – Alternatives of AJAX.

UNIT V XML (9 Hrs)

Introduction to XML – Uses of XML – Simple XML – XML key components – DTD and Schemas – Well-formed XML document – Applications of XML – XSL and XSLT.

Text Books

1. Keith Wald, Jason Lengstorf," Pro PHP and jQuery", Paperback, 2016.
2. Semmy Purewal, "Learning Web App Development", O'Reilly Media, 2014.
3. P.J. Deitel AND H.M. Deitel," Internet and World Wide Web - How to Program", Pearson Education, 2009.

Reference Books

1. Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, "Enterprise Web Development ", O'Reilly Media, 2014.
2. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley & Sons, Inc, 2013.
3. UttamK.Roy, "Web Technologies", Oxford University Press, 2010.
4. Rajkamal, "Web Technology", Tata McGraw-Hill, 2009.
5. Shklar, Leon, Rosen, Rich, "Web Application Architecture: Principles, Protocols and Practices", Wiley Publication, 2009.

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2. https://www.geeksforgeeks.org/web-technology/
3. https://www.guru99.com/cakephp-tutorial.html
4. https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business
5. http://Oriel.ly/learning-web-app

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
2	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
5	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CSO402	**ANALYSIS OF ALGORITHMS** (Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To analyze the performance of algorithms in terms of time and space complexity.
- To understand the performance of the algorithms such as divide and conquer, greedy method
- To solve problems using Dynamic Programming and derive the time complexity.
- To solve problems using Backtracking technique and derive the time complexity.
- To solve problems using Branch and Bound technique and derive the time complexity.

Course Outcomes

Upon completion of the course, students shall have ability to

CO1 - Choose the appropriate data structure and algorithm design method for a specified application.**(K2)**

CO2 - Ability to understand the design technique such as divide and conquer, greedy method applied to realistic problems and analyse them. **(K3)**

CO3 - Ability to understand the dynamic programming design technique and how it is applied to realistic problems and analyze them. **(K3)**

CO4 - Ability to understand the backtracking design technique and how it is applied to realistic problems and analyze them. **(K3)**

CO5 - Ability to understand Branch and Bound design technique and how it is applied to realistic problems and analyze them. **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis – Time complexity, Space complexity, Asymptotic Notation – Big oh notation, Omega notation, Theta notation and Little oh notation.

UNIT II DIVIDE AND CONQUER METHOD AND GREEDY METHOD (9 Hrs)

Divide and Conquer method: Applications – Binary search, Merge sort, Quick sort. Greedy method: General method, applications – Knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING (9 Hrs)

Dynamic Programming: Applications - Multistage graphs, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT IV BACKTRACKING (9 Hrs)

Backtracking: General method, Applications – N-queen problem, Sum of subsets problem, Graph Coloring – Hamiltonian Cycles.

UNIT V BRANCH AND BOUND (9 Hrs)

Branch and Bound: General method, Applications – Traveling sales person problem, 0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution.

Text Books

1. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", PHI/Pearson Education, 3rd Edition, 2009.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.

Reference Books

1. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India, 2006.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education Asia, 3rd Edition, 2010.
3. Donald E Knuth, "The Art of Computer Programming, Volume I & II", Addison Wessely, Third Edition, 2011.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2006.
5. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.

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2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
3. https://www.javatpoint.com/daa-tutorial
4. https://www.guru99.com/design-analysis-algorithms-tutorial.html
5. https://www.geeksforgeeks.org/fundamentals-of-algorithms/

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2	3	2	3	3	2	2	1	-	-	-	-	-	2	1	2
3	3	3	3	3	2	2	2	-	2	-	-	-	2	1	2
4	3	2	3	3	3	2	2	-	-	-	3	-	2	1	2
5	3	3	3	3	2	2	2	-	-	-	3	2	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20ICO401

SENSORS AND TRANSDUCERS

(Computer Science Engineering)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- Get to know the methods of measurement, classification of transducers and to analyze error.
- Get exposed to different types of resistive transducers and their application areas
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on variety of transducers
- To introduce about advancements in sensor technology.

Course Outcomes

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

CO1 - Understand the concepts of classification of Transducers. **(K2)**
CO2 - Familiar with the working of resistance Transducer. **(K3)**
CO3 - Familiar with the principle and working of various Inductive and Capacitive transducer. **(K1)**
CO4 - Able to design signal conditioning circuit for various transducers. **(K3)**
CO5 - Able to identify or choose a transducer for a specific measurement application. **(K4)**

UNIT I CLASSIFICATION OF TRANSDUCERS (9 Hrs)

General concepts and terminology of measurement systems, transducer classification, general input-output configuration, static and dynamic characteristics of a measurement system, Statistical analysis of measurement data.

UNIT II RESISTANCE TRANSDUCERS (9 Hrs)

Resistive transducers: Potentiometers, metal and semiconductor strain gauges and signal conditioning circuits, strain gauge applications: Load and torque measurement, Digital displacement sensors.

UNIT III INDUCTIVE AND CAPACITIVE TRANSDUCERS (9 Hrs)

Transducers: – Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer – Variable reluctance transducers – Synchros – Microsyn – Principle of operation, construction details, characteristics of capacitive transducers – Different types & Signal Conditioning – Applications:- Capacitor microphone, Capacitive pressure sensor, Proximity sensor.

UNIT IV OTHER TRANSDUCERS (9 Hrs)

Piezoelectric transducers and their signal conditioning, Seismic transducer and its dynamic response, photoelectric transducers, Hall effect sensors, Magnetostrictive transducers. Eddy current transducers. Hall effect transducers – Optical sensors, IC sensor for temperature – signal conditioning circuits, Introduction to Fiber optic sensors – Temperature, pressure, flow and level measurement using fiber optic sensors

UNIT V SMART TRANSDUCER (9 Hrs)

Introduction to semiconductor sensor, materials, scaling issues and basics of micro fabrication. Smart sensors, Intelligent sensor, Mems Sensor, Nano-sensors, SQUID Sensors- Environmental Monitoring sensors

Text Books

1. Doebelin E.O. and Manik D.N., "Measurement Systems", 6th Edition, McGraw-Hill Education Pvt. Ltd., 2011.
2. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge,2003
3. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design Clarendon, Oxford 2nd edition Jacob Fraden - 2010
4. Doeblin E..O. "Measurement System Applications and Design", TMH, 5th Edition, 2004.

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1. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol.1 ISA/CRC Press, 2003.
2. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th edition, Vol.2 ASME PTC ,2018
3. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
4. John P. Bentley, Principles of Measurement Systems, 3rd Edition, Pearson Education, 2000.

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1. www.electrical4u.com
2. https://nptel.ac.in/courses/108108147/
3. https://www.youtube.com/watch?v=1uPTyjxZzyo

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COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	2	-	-	1	2	-	-	-	2	-	-	-	-
2	2	-	3	-	-	1	2	-	-	-	2	-	-	-	-
3	2	-	2	-	-	1	2	-	-	-	2	-	-	-	-
4	2	-	3	-	-	1	2	-	-	-	-	-	-	-	-
5	2	-	3	-	2	2	3	-	-	-	2	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

	CONTROL SYSTEM ENGINEERING	L	T	P	C	Hrs
U20ICO402	(Computer Science Engineering)	3	0	0	3	45

Course Objectives

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems
- To introduce stability analysis of control systems.
- To introduce compensation technique.

Course Outcomes

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

CO1 - Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form. **(K2)**
CO2 - Perform time domain analysis of various models of linear system **(K3)**
CO3 - Do frequency domain analysis of various models of linear system **(K4)**
CO4 - Determine and analyse the stability of the system **(K4)**
CO5 - Design the compensation technique that can be used to stabilize control systems. **(K3)**

UNIT I SYSTEM CONCEPTS (9 Hrs)

Types of system – open loop systems, closed loop systems, Basic elements in control system – Mathematical models of physical system: Differential equation- transfer functions of simple electrical networks – D.C and A.C servo motor – Mechanical system- Translational and Rotational system – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE ANALYSIS (9 Hrs)

Standard test signals -Time response of first and second order system, Time domain- specifications- Generalized error series – Steady state error and error constants

UNITIII FREQUENCY RESPONSE ANALYSIS (9 Hrs)

Frequency response of the system – Correlation between time and frequency response – Gain and Phase margin – Bode plot, Polar Plot.

UNIT IV STABILITY ANALYSIS (9 Hrs)

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Nyquist stability criterion.

UNIT V COMPENSATION NETWORKS (9 Hrs)

Introduction to compensation networks - Lag, Lead and Lag Lead networks - Effect of providing Lag, Lead and Lag-Lead compensation on system performance and design using bode plot

Text Books

1. Nagrath I J and Gopal M, Control System Engineering, New Age International Pvt Ltd, Sixth Edition, 2017
2. Ogata K, —Modern Control Engineering‖, Prentice-Hall of India Pvt Ltd., New Delhi, Fifth Edition, 2015.

Reference Books

1. Norman S Nise, Control System Engineering , John Wiley and sons, inc., Seventh Edition, 2015
2. Benjamin C Kuo, —Automatic Control Systems‖, Prentice Hall India Pvt. Ltd, Ninth Edition, 2015
3. Smarajith Ghosh, —Control Systems Theory and Applications‖, Pearson Education, Singapore, Sixth Edition, 2015
4. Richard C. Dorf, Robert H Bishop, —Modern Control Systems‖, Pearson Education, Twelfth Edition, 2017

Web References

1. https://lecturenotes.in/notes/6579-note-for-control-system-engineering-cse-by-gyana-ranjan-biswal
2. https://www.smartzworld.com/notes/control-systems-pdf-notes-cs/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	2	2	1	-	-	1	1	1	2	-	-	-
2	2	3	2	2	1	2	1	1	1	1	1	2	-	-	-
3	2	2	1	2	2	1	1	-	-	1	-	1	-	-	-
4	2	2	1	2	2	1	1	-	-	1	-	1	-	-	-
5	3	3	2	2	2	1	1	-	1	-	1	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20BMO401	**MEDICAL ELECTRONICS** (Common to EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS)	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To gain knowledge about the various physiological parameters measurements
- To understand the various biochemical and nonelectrical sensors
- To study about the assist devices
- To gain knowledge on surgical equipments and telemetry in healthcare
- To understand the concepts of recent advancements in healthcare

Course Outcomes

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

CO1 - Explain the electro- physiological parameters and bio-potentials recording **(K2)**
CO2 - Measure the biochemical and non-electrical physiological parameters **(K2)**
CO3 - Interpret the various assist devices used in the hospitals **(K3)**
CO4 - Identify physical medicine methods and biotelemetry **(K3)**
CO5 - Analyse recent trends in medical instrumentation **(K3)**

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING (9 Hrs)

Sources of bio medical signals, Bio-potentials, Bio potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT (9 Hrs)

pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES (9 Hrs)

Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters, Heart-Lung Machine.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY (9 Hrs)

Diathermies - Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry - Single Channel and Multiple Channel.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION (9 Hrs)

Telemedicine, Insulin Pumps, Radio pill, Endo-microscopy, Brain machine interface, Lab on a chip, Cryogenic Technique.

Text Books

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2011.
2. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2017.
3. John G.Webster, "Medical Instrumentation Application and Design", Third Edition, Wiley India , 2012.

Reference Books

1. Joseph J.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2011.
2. R.Anandanatarajan, "Biomedical Instrumentation and Measurements", Second Edition, PHI Learning, 2016.
3. Mandeep singh, "Introduction to Biomedical Instrumentation", Second Edition, Prentice Hall of India, New Delhi,2014
4. Shakti Chatterjee, Aubert Miller, "Biomedical Instrumentation Systems", Cengage Learning, 2012
5. C.Raja Rao, Sujoy K.Guha, " Principles of Medical Electronics and Biomedical Instrumentation", Universities Press, 2010

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1. https://www.nap.edu/read/21794/chapter/7
2. https://www.embs.org/about-biomedical-engineering/our-areas-of-research/diagnostic-therapetic systems
3. https://nptel.ac.in/courses/127/106/127106136/
4. medicinenet.com/script/main/art.asp?articlekey=6414
5. https://www.verywellhealth.com/cardiopulmonary-bypass-machine-used-for-surgery-3157220

COs/POs/PSOs Mapping

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2	3	2	-	2	2	2	-	1	-	-	-	-	1	-	-
3	3	-	-	2	3	3	-	1	-	-	-	-	1	-	-
4	3	-	2	2	3	2	-	1	-	-	-	-	1	-	-
5	3	2	2	3	3	2	-	1	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U20BMO402	TELEMEDICINE (Common to EEE, ECE, CSE, IT, ICE, CCE, AI&DS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives:

- To understand the classification of telemetry.
- To gain knowledge about biotelemetry principles
- To know about the applications of telemetry in various fields
- To provide the idea about the value of telemedicine
- To know the various applications in telemedicine.

Course Outcomes:

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

CO1 - Categorize the telemetry systems **(K2)**
CO2 - Understand the principles of biotelemetry in transmission of biological signals **(K3)**
CO3 - Apply the various Biotelemetry applications for diagnostics **(K3)**
CO4 - Acquire clear idea about the fundamentals of telemedicine **(K2)**
CO5 - Know about various applications of telemedicine **(K3)**

UNIT I INTRODUCTION TO TELEMETRY (9 Hrs)

Basic system, Classification, Non electrical telemetry systems, Mechanical and Pneumatic type, Voltage and Current telemetry systems, Local transmitters and Converters, Frequency telemetry system, Power Line carrier communication (PLCC).

UNIT II BIOTELEMETRY (9 Hrs)

Radio Telemetry principles, FM, AM, PCM, Transmission of biological data through radio telemetry.

UNIT III APPLICATION OF BIOTELEMETRY (9 Hrs)

Wireless Telemetry - Single Channel and Multi-channel Telemetry systems, Multi Patient Telemetry, Implantable Telemetry Systems, Ambulatory patient monitoring.

UNIT IV FUNDAMENTALS OF TELEMEDICINE (9 Hrs)

History and advancements in telemedicine, Benefits of telemedicine, Functional Block of a telemedicine system, Use of computers in distance mode of healthcare delivery, Familiarizing with technology of telemedicine, scanner, electro stethoscope, data reception equipment, Scope for telemedicine, Limitations of telemedicine.

UNIT V APPLICATIONS OF TELEMEDICINE (9 Hrs)

Telemedicine in Neuroscience, Telecardiology, Telepathology, Telepediatrics, Telepharmacy, Telepsychiatry and mental health, Veterinary.

Text Books

1. Marilyn J. Field , "A Guide to Assessing Telecommunications in Health Care", Fourth Edition, Academy Press,2011.
2. Bashshur , R. L. , Sanders, J. H and Shannon, G, "Telemedicine: Theory and Practice", Eight Edition, Springer,2014.
3. Olga (EDT), Ferre Roca, M. Sosa, "Handbook of Telemedicine", Third Edition, IOS press 2009.

Reference Books

1. Bemmel, J.H. van, Musen, M.A. (Eds.), "Handbook of Medical Informatics", Second Edition, Springer, 2010.
2. Simpson, W, "Video over IP. A practical guide to techhology and applications'", Ninth Edition, Focal Press, Elsevier, 2009.
3. Ferrer-Roca, O., Sosa-Iudicissa, , "Handbook of Telemedicine", IOS Press, 2012
4. Norris, A.C, "Essentials of Telemedicine and Telecare", Eight Edition, Wiley, 2017
5. Wotton, R., Craig, J., Patterson, V. (Eds.), "Introduction to Telemedicine", Fifth Edition, Royal Society of Medicine Press Ltd., 2014.

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1. https://en.wikipedia.org/wiki/Biotelemetry
2. https://www.who.int/goe/publications/goe_telemedicine_2010.pdf
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5927731/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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1	3	-	-	-	2	1	-	1	-	2	-	-	-	-	-
2	3	2	-	-	2	1	-	1	-	2	-	-	-	-	-
3	3	2	3	2	2	1	-	1	-	2	-	-	2	-	-
4	3	2	-	2	2	1	-	1	-	2	-	-	2	-	-
5	3	2	3	2	2	1	-	1	-	2	-	-	2	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20CCO402	**INTRODUCTION TO COMMUNICATION SYSTEMS** (Common to EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME)	3	0	0	3	45

Course Objectives

- To provide basic knowledge of signals
- To study the various analog and digital modulation techniques
- To study the pulse modulation and multiplexing
- To infer Digital transmission techniques
- To provide knowledge about various multiple access technology and advanced communication techniques

Course Outcomes

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

CO1- Comprehend the basic Characteristics of the signals.(**K2**)

CO2- Comprehend needs of modulation and various analog modulation techniques (**K2**)

CO3- Illustrate pulse modulation and multiplexing (**K3**)

CO4- Explain Digital transmission techniques (**K2**)

CO5- Describe multiple access techniques and advanced communication systems.(**K2**)

UNIT I SIGNAL ANALYSIS (9 Hrs)

Introduction to Signals- Representation and classification of Signals, Representation of signal in frequency domain, introduction to Spectrum of signal- Introduction to Fourier series and Fourier Transform.

UNIT II ANALOG COMMUNICATION (9 Hrs)

Need for Modulation-– Block diagram of analog communication System- Amplitude Modulation – AM, DSBSC, SSBSC, modulators and demodulators – Angle modulation – PM and FM – modulators and demodulators – Superheterodyne receivers.

UNIT III PULSE COMMUNICATION (9 Hrs)

Low pass sampling theorem – Quantization – PAM – PCM, DPCM, DM, and ADPCM And ADM - Time Division Multiplexing, Frequency Division Multiplexing.

UNIT IV DIGITAL COMMUNICATION (9 Hrs)

Comparison of digital and analog communication system- Block diagram of digital communication system Phase shift keying – BPSK, DPSK, QPSK.

UNIT V MULTIPLE ACCESS TECHNIQUES AND ADVANCED COMMUNICATION (9 Hrs)

Multiple Access techniques- FDMA, TDMA, CDMA- Frequency reuse, Handoff- Block diagram of advanced communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

Text Books

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", 3rd edition, TMH 2007
2. S. Haykin, "Digital Communications", John Wiley, 2005.
3. B.P.Lathi," Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007.

Reference Books

1. H P Hsu, Schaum Outline Series, "Analog and Digital Communications", TMH 2006
2. B.Sklar," Digital Communications Fundamentals and Applications", 2nd edition Pearson Education 2007.
3. A.Bource Carson and Paul B.Crilly, "Communication Systems", 5th Edition, Mc Graw Hill, 2010
4. Torrieri, Don, "Principles of Spread Spectrum Communication Systems", Springer, 2015
5. Simon Haykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001.

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1. www.allaboutcircuits.com
2. https://nptel.ac.in/courses/108/102/108102096/
3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
2	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
3	3	3	1	-	1	-	-	-	-	-	1	1	-	-	1
4	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
5	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
U20ADO401	**KNOWLEDGE REPRESENTATIONS AND REASONING**	3	0	0	3	45

Course Objectives

- To investigate the key concepts of knowledge representation (KR) techniques and different notations.
- To integrate the KR view as knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques.
- To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes

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

CO1 - Analyse and design knowledge based systems intended for computer implementation. **(K3)**

CO2 - Acquire theoretical knowledge about principles for logic-based representation and reasoning. **(K2)**

CO3 - Ability to understand knowledge-engineering process. **(K2)**

CO4 - Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and algorithmic decision-making. **(K2)**

UNIT I

(9 Hrs)

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic. Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT II

(9 Hrs)

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time.

UNIT III

(9 Hrs)

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.

UNIT IV

(9 Hrs)

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT V

(9 Hrs)

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics. Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition.

Text Books

1. John F. Sowa, Thomson Learning "Knowledge Representation logical, Philosophical, and Computational Foundations", Course Technology Inc. publication, 1999.
2. Ronald J. Brachman, Hector J. Levesque,"Knowledge Representation and Reasoning", Morgan Kaufmann; 1st edition, 2004.
3. Eileen Cornell Way "Knowledge Representation and Metaphor" Springer; 1991st edition, 1991.

Reference Books

1. Trevor Bench-Capon, "Knowledge representation: an approach to artificial intelligence", Academic Press, 2014.
2. Yulia Kahl, Michael Gelfond "Knowledge Representation, Reasoning, and the Design of Intelligent Agents The Answer-Set Programming Approach", Cambridge University Press; 1st edition, 2014.
3. Arthur B. Markman, "Knowledge representation" Psychology Press; 1st edition, 1998.
4. Sanida Omerović, Grega Jakus, V. Milutinovic, Sašo Tomažič "Concepts, Ontologies, and Knowledge Representation" Springer; 2013.
5. Bernhard Nebel, Gerhard Lakemeyer "Foundations of Knowledge Representation and Reasoning" Springer, 1994.

Web References

1. https://www.javatpoint.com/knowledge-representation-in-ai
2. https://nptel.ac.in/courses/106/106/106106140/
3. https://www.youtube.com/watch?v=kXlr6ydiPAQ

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	1	3	-	-	-	-	-	-	-	2	1	3
2	2	3	2	3	2	-	-	-	-	-	-	-	2	1	3
3	1	3	1	2	2	-	-	-	-	-	-	-	2	1	3
4	1	2	1	2	1	-	-	-	-	-	-	-	2	1	3
5	2	1	3	1	3	-	-	2	-	-	-	-	2	1	3

Correlation Level: **1 - Low, 2 - Medium, 3 - High**

U20ADO402 INTRODUCTION TO DATA SCIENCE

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To learn the basics of data science
- To enable the students to understand the statistics and probability.
- To understand the tools in developing and visualizing data.
- To gain good knowledge in the application areas of data science.
- To inculcate the perceiving, ethics surrounding privacy and acting of data science applications.

Course Outcomes

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

CO1 - Explore the fundamental concepts of data science. **(K2)**

CO2 - To understand the Mathematical Knowledge for Data Science.**(K2)**

CO3 - Visualize and present the inference using various tools. **(K3)**

CO4 - To expose the different opportunities in Industries. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and decision-making. **(K2)**

UNIT I INTRODUCTION TO DATA SCIENCE (9 Hrs)

Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation..

UNIT II MATHEMATICAL PRELIMINARIES (9 Hrs)

Probability: Probability vs. Statistics – Compound Events and Independence – Conditional Probability – Probability Distribution. Descriptive Statistics: Centrality Measures – Variability Measures - Interpreting Variance – Characterizing Distributions. Correlation Analysis: Correlation Coefficient – The Power and Significance – Detection Periodicities. Logarithms: Logarithms and Multiplying Probabilities – Logarithms and Ratios – Logarithms and Normalizing Skewed Distributions.

UNIT III DATA SCIENCE TOOLS (9 Hrs)

Introduction to Data Science Tool – Data Cleaning Tools – Data Munging and Modelling Tools – Data Visualization Tools – Tools for Data Science.

UNIT IV INDUSTRIALIZATION, OPPURTUNITIES AND APPLICATIONS (9 Hrs)

Data Economy and Industrialization – Introduction: Data Economy, Data Industry, Data Services – Data Science Application: Introduction, General Application Guidance - Different Domain – Advertising – Aerospace and Astronomy – Arts, Creative Design and Humanities – Bioinformatics – Consulting Services – Ecology and Environment – Ecommerce and Retail - Education – Engineering – Finance and Economy – Gaming.

UNIT V ETHICS AND RECENT TRENDS (9 Hrs)

Data Science Ethics – Doing good data science – Owners of the data - Valuing different aspects of privacy - Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends.

Text Books

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications Co., 1st edition, 2016.
2. Chirag Shah, "A Hands on Introduction to Data Science", Cambridge University Press, 2020.
3. SinanOzdemir, "Principles of Data Science", Packt Publication, 2016.
4. D J Patil, Hilary Mason, Mike Loukides, "Ethics and Data Science", O' Reilly, 1st edition, 2018.

Reference Books

1. Hector Guerrero, "Excel Data Analysis: Modeling and Simulation", Springer International Publishing, 2nd Edition, 2019.
2. Paul Curzon, Peter W. Mc Owan, "The Power of Computational Thinking", World Scientific Publishing, 2017.
3. Steven S. Skiena, "Data Science Design Manual", Spring International Publication, 2017.
4. Rajendra Akerkar, Priti Srinivas Sajja, "Intelligence Techniques for Data Science", Spring International Publication, 2016.
5. Longbing Cao "Data Science Thinking: The Next Scientific, Technological and Economic Revolution", Spring International Publication, 2018.

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1. https://www.youtube.com/watch?v=-ETQ97mXXF0&ab_channel=edureka%21
2. https://www.javatpoint.com/data-science
3. https://www.coursera.org/browse/data-science /

COs/POs/PSOs Mapping

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3	2	1	3	2	3	-	-	-	-	-	-	-	2	1	2
4	1	2	2	1	1	-	-	-	-	-	-	-	-	1	2
5	2	1	1	2	1	-	-	1	-	-	-	-	-	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

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[An Autonomous Institution]

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

(As per UGC - 2018 Regulations and Affiliated to Pondicherry University)

PUDUCHERRY – 605107

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.TECH.

COMPUTER SCIENCE AND ENGINEERING

(REGULATIONS - 2020)

CURRICULUM AND SYLLABI

VISION AND MISSION OF THE INSTITUTE

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society

Mission

M1 - Quality Education	To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.
M2 -Research and Innovation	To foster value based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.
M3 - Employability and Entrepreneurship	To inculcate the employability and entrepreneurial skills through value and skill based training
M4:- Ethical values	To instill deep sense of human values by blending societal righteousness with academic professionalism for growth of society

VISION AND MISSION OF THE DEPARTMENT

Vision

To create a productive learning and research environment for graduates to become highly dynamic, competent, ethically responsible, professionally knowledgeable in the field of computer science and engineering to meet the industrial needs on par with global standards.

Mission

M1: Quality Education: Empowering the students with the necessary technical skills through quality education to grow professionally.

M2: Innovative Research: Advocating the innovative research ideas by incorporating with industries for developing products and services.

M3: Placement and Entrepreneurship: Advancing the education by strengthening the Industry-academic relationship through hands-on training to seek placement in the top most industries or to develop a start-ups.

M4: Ethics and Social Responsibilities: Stimulating professional behavior and good ethical values to improve the leadership skills and social responsibilities.

PROGRAMME OUTCOMES (POs)

PO1: Exploration of Research:

An ability to independently carry out research/investigation and development work to solve practical problems.

PO2: Technical Skill:

An ability to write and present a substantial technical report/document.

PO3: Expertise in Academics:

Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: Problem solving:

An ability to discriminate, analyzes, evaluate and synthesize the technologies to provide solution for multidimensional engineering problems.

PO5: Usage of Modern Tools:

Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities with an understanding of the limitations.

PO6: Ethical Practices and Social Responsibility:

Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Technical Knowledge: To acquire a comprehensive knowledge in computer science engineering concepts and apply them for the investigation of real world problems.

PEO 2: **Research and Development:** To prepare graduates who will demonstrate analytical, research, design and implementation skills offering techno-commercially feasible and socially acceptable solutions.

PEO 3: **Leadership:** To prepare graduates who will thrive to pursue life-long learning and contribute to society as an ethical and responsible citizen.

PEO 4: Professional Behavior: To deliver graduates to design and implement solutions for rapidly changing computing problems and information system environments to adapt innovation.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Technical Knowledge in Computer Science and Engineering: Apply the fundamentals of knowledge in engineering to identify, formulate, design and investigate complex engineering problems in the real world applications.

PSO2: Multidisciplinary Competency: Apply the appropriate techniques and modern engineering software tools in computer science and engineering to engage in learning and to successfully adapt in multi-disciplinary environments.

PSO3: Competency in Research and Development: Ability to take up higher studies, Research & Development and Entrepreneurships in the modern computing environment.

STRUCTURE FOR POST GRADUATE ENGINEERING PROGRAM

Sl.No.	Course Category	Breakdown of Credits
1	Humanities and Social Sciences (HS)	-
2	Basic Sciences(BS)	3
3	Engineering Sciences (ES)	-
4	Professional Core (PC)	31
5	Professional Electives (PE)	18
6	Open Electives (OE)	0
7	Project Work and Internship	20
8	Employability Enhancement Courses (EEC)	-
9	Mandatory courses (MC)	-
Total		**72**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	**Course Category**	**Credits per Semester**				**Total Credits**
		I	**II**	**III**	**IV**	
1	Humanities and Social Sciences (HS)	-	-	-	-	-
2	Basic Sciences(BS)	3	-	-	-	3
3	Engineering Sciences (ES)	-	-	-	-	-
4	Professional Core (PC)	15	16	-	-	31
5	Professional Electives (PE)	3	6	9	-	18
6	Open Electives (OE)	-	-	-	-	0
7	Project Work and Internship	-	-	8	12	20
8	Employability Enhancement Courses (EEC)*	-	-	-	-	-
9	Mandatory Courses (MC)*	-	-	-	-	-
Total		**21**	**22**	**17**	**12**	**72**

CURRICULUM

SEMESTER – I

Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	P20BST103	Mathematical Foundation of Formal Approach	BS	2	2	0	3	40	60	100
2	P20CST101	Advanced Data Structures and Algorithms	PC	3	0	0	3	40	60	100
3	P20CST102	Cloud and Big Data Analytics	PC	3	0	0	3	40	60	100
4	P20CST103	Artificial Intelligence & Agent Technology	PC	3	0	0	3	40	60	100
5	P20CCT101	Research Methodology and IPR	PC	2	0	0	2	40	60	100
6	P20CSE1XX	Professional Elective - I *	PE	3	0	0	3	40	60	100
Practical										
7	P20CSP101	Advanced Data Structures and Algorithms Laboratory	PC	0	0	4	2	50	50	100
8	P20CCP101	Technical Report Writing and Seminar	PC	0	0	4	2	100	-	100
Audit Course										
9	P20ACT10X	Audit Course-I**	AC	0	0	2	-	100	-	100
Employability Enhancement Course										
10	P20CSC1XX	Employability Enhancement Course-I#	EEC	0	0	4	-	100	-	100
TOTAL							**21**	**590**	**410**	**1000**

SEMESTER – II

Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	P20CST204	IOT and Edge Computing	PC	3	0	0	3	40	60	100
2	P20CST205	Adhoc and Wireless Sensor Networks	PC	3	0	0	3	40	60	100
3	P20CST206	Internals of Operating Systems	PC	3	0	0	3	40	60	100
4	P20CST207	Agile and Software Project Management	PC	3	0	0	3	40	60	100
5	P20CSE2XX	Professional Elective - II*	PE	3	0	0	3	40	60	100
6	P20CSE2XX	Professional Elective - III*	PE	3	0	0	3	40	60	100
Practical										
7	P20CSP202	Internet of Things Laboratory	PC	0	0	4	2	50	50	100
8	P20CCP202	Seminar on ICT a hands on approach	PC	0	0	4	2	100	-	100
Audit Course										
9	P20ACT20X	Audit Course-II**	AC	0	0	2	-	100	-	100
Employability Enhancement Course										
10	P20CSC2XX	Employability Enhancement Course-II#	EEC	0	0	4	-	100	-	100
TOTAL							**22**	**590**	**410**	**1000**

SEMESTER – III										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	P20CSE3XX	Professional Elective - IV*****	PE	3	0	0	3	40	60	100
2	P20CSE3XX	Professional Elective - V*****	PE	3	0	0	3	40	60	100
3	P20CSE3XX	Professional Elective - VI*****	PE	3	0	0	3	40	60	100
Practical										
4	P20CSW301	Project Phase - I	PW	0	0	12	6	50	50	100
5	P20CSW302	Internship	PW	0	0	0	2	100	-	100
Employability Enhancement Course										
6	P20CSS301	NPTEL/GIAN/MOOC	EEC	0	0	0	-	100	-	100
TOTAL							**17**	**370**	**230**	**600**

SEMESTER – IV										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Practical										
1	P20CSW403	Project Phase - II	PW	0	0	24	12	50	50	100
TOTAL							**12**	**50**	**50**	**100**

***   Professional Elective Courses are to be selected from the list given in Annexure I***
# Employability Enhancement Courses are to be selected from the list given in Annexure II
***** Audit Courses are to be selected from the list given in Annexure III***

BS- Basic Science
PC – Professional Core
PE – Professional Elective
PW- Project Work
CC- Common Course
AC- Audit Course
EEC - Employability Enhancement Course

CREDIT DISTRIBUTION

Semester	I	**II**	**III**	**IV**	**Total**
Credits	21	22	17	12	72

Total number of credits required to complete
M.Tech in Computer Science and Engineering : 72 credits

ANNEXURE-I

PROFESSIONAL ELECTIVE COURSES

Sl. No.	Course Code	Course Title
Professional Elective-I		
1.	P20CSE101	Robotic Process Automation(RPA)
2.	P20CSE102	Web Services and Internet Engineering
3.	P20CSE103	Service Oriented Architecture
4	P20CSE104	Advanced Java Programming
5	P20CSE105	Cryptography & Information Security
Professional Elective-II		
1.	P20CSE206	Web Analytics and Development
2.	P20CSE207	Advances in Compiler Construction
3.	P20CSE208	Quantum Computing
4	P20CSE209	Social Network Analysis
5	P20CSE210	Data Compression
Professional Elective-III		
1.	P20CSE211	Business Intelligence and Reporting
2.	P20CSE212	Ethical Hacking and Digital Forensics
3.	P20CSE213	Trusted Internet
4	P20CSE214	Soft Computing
5	P20CSE215	Semantic Web and Knowledge Management
Professional Elective-IV		
1.	P20CSE316	Real-Time Systems
2.	P20CSE317	Data Storage Technologies & Networks
3.	P20CSE318	Mobile Application Development
4	P20CSE319	Cognitive Science
5	P20CSE320	Block Chain and Crypto currency
Professional Elective-V		
1.	P20CSE321	Machine Learning Techniques
2.	P20CSE322	Design of Embedded Systems
3.	P20CSE323	Data Warehousing and Data Mining
4	P20CSE324	Game Design and Augmented Reality
5	P20CSE325	Mobile and Pervasive Computing
Professional Elective-VI		
1.	P20CSE326	Data Visualization & Reports
2.	P20CSE327	Bio Inspired Computing
3.	P20CSE328	Advances in Database Systems
4	P20CSE329	5G Networks and Applications
5	P20CSE330	User Interface/ User Experience Design

ANNEXURE-II

EMPLOYABILITY ENHANCEMENT COURSES

Sl.No.	Course Code	Course Title
1.	P20CSCX01	Advanced Python
2.	P20CSCX02	Android Programming
3.	P20CSCX03	Artificial Intelligence
4.	P20CSCX04	Artificial Intelligence And Edge Computing
5.	P20CSCX05	Azure DevOps
6.	P20CSCX06	Block Chain
7.	P20CSCX07	CCNA (Routing And Switching)
8.	P20CSCX08	CCNA (Wireless)
9.	P20CSCX09	Cloud Computing
10.	P20CSCX10	Cyber Security
11.	P20CSCX11	Data Science
12.	P20CSCX12	Data Science and Data Analytics
13.	P20CSCX13	Data Science using Python
14.	P20CSCX14	Deep Learning
15.	P20CSCX15	Internet of Things
16.	P20CSCX16	IoT using Python
17.	P20CSCX17	Java Programming
18.	P20CSCX18	Machine Learning
19.	P20CSCX19	Robotics
20.	P20CSCX20	Software testing

ANNEXURE-III

AUDIT COURSES

(Common to all M.Tech Programme)

Sl. No.	Course Code	Course Title
1.	P20ACTX01	English for Research Paper Writing
2.	P20ACTX02	Disaster Management
3.	P20ACTX03	Sanskrit for Technical Knowledge
4.	P20ACTX04	Value Education
5.	P20ACTX05	Constitution of India
6.	P20ACTX06	Pedagogy Studies
7.	P20ACTX07	Stress Management by Yoga
8.	P20ACTX08	Personality Development Through Life Enlightenment Skills
9.	P20ACTX09	Unnat Bharat Abhiyan

P20BST103

MATHEMATICAL FOUNDATION OF FORMAL APPROACH

L	T	P	C	Hrs
2	2	0	3	45

Course Objectives

- Provide mathematical background and sufficient experience.
- To understand various topics of discrete mathematics like matrix algebra, logic and proofs, combinatory, graphs, algebraic structures, formal languages and finite state automata.
- To extend student's Logical and Mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses.
- To introduce application of ideas to solve practical problems.

Course Outcomes

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

CO1 - Basic knowledge of matrix, set theory, functions and relations concepts needed for designing and solving problems. **(K2)**

CO2 - Logical operations and predicate calculus needed for computing skill. **(K3)**

CO3 - Design and solve Boolean functions for defined problems. **(K3)**

CO4 - Apply the acquired knowledge of formal languages to engineering areas like Compiler Design. **(K3)**

CO5 - Apply the acquired knowledge of finite automata theory and to design discrete problems to solve by Computers. **(K3)**

UNIT I MATRIX ALGEBRA (9 Hrs)

Matrices - Rank of a matrix - Solving system of equations – Eigen values and Eigenvectors - Cayley - Hamilton theorem - Inverse of a matrix.

UNIT II BASIC SET THEORY (9 Hrs)

Basic definitions - Venn diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion – Partitions - Permutation and combination – Relations - Properties of relations - Matrices of relations - Closure operations on relations - Functions - Injective, subjective and objective functions.

UNIT III MATHEMATICAL LOGIC (9Hrs)

Propositions and logical operators - Truth table - Propositions generated by a set - Equivalence and implication - Basic laws - Some more connectives - Functionally complete set of connectives - Normal forms - Proofs in propositional calculus - Predicate calculus.

UNIT IV FORMAL LANGUAGES (9 Hrs)

Languages and grammars - Phrase structure grammar - Classification of grammars -Pumping lemma for regular languages - Context free languages.

UNIT V FINITE STATE AUTOMATA (9 Hrs)

Finite state automata - Deterministic finite state automata (DFA) - Non deterministic finite state automata (NFA) - Equivalence of DFA and NFA - Equivalence of NFA and Regular Languages.

Text Books

1. David Makinson, “Sets, Logic and Maths for Computing”, Springer Indian Reprint, 2011.
2. Grimaldi, R.P and Ramana, B.V. "Discrete and Combinatorial Mathematics", Pearson Education, Fifth Edition, 2006.
3. Hopcroft J.E and Ullman,J.D, “Introduction to Automata Theory, Languages and Computation”, Narosa Publishing House, Delhi, 2002.

Reference Books

1. Kenneth H. Rosen, “Discrete Mathematics and Its Applications”, Tata McGraw Hill, 4th Edition, 2002.
2. Sengadir, T. “Discrete Mathematics and Combinatorics" Pearson Education, New Delhi, 2009.
3. Trembley, J.P. and Manohar, R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, New Delhi, 2007.
4. Venkataraman, M.K., “Engineering Mathematics”, Volume-II, National Publishing Company, Second Edition, 1989.

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1. https://sites.math.northwestern.edu/~mlerma/courses/cs310-05s/
2. https://csd.cs.cmu.edu/course-profiles/15-151-Mathematical-Foundations-for-Computer-Science
3. https://www.coursera.org/learn/mathematics-for-computer-science
4. https://www.cse.iitb.ac.in/~supratik/courses/cs719/index.html
5. https://www.irif.fr/~jep/PDF/MPRI/MPRI.pdf

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**						**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**
1	2	1	-	-	-	1	1	2	1
2	3	2	1	1	-	1	2	2	1
3	3	2	1	1	-	1	2	2	1
4	3	2	1	1	-	-	2	2	1
5	3	2	1	1	-	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

P20CST101 ` ADVANCED DATA STRUCTURES AND ALGORITHMS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To learn the mathematical basics and various notations to analyze the complexities of Algorithms.
- To understand the various sorting techniques and tree data structure.
- To understand and analyze the various Text Processing operations and their performances.
- To analyze and understand graph data structures and their applications.
- To understand the performance of polynomial time and NP-Completeness.

Course Outcomes

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

CO1 - Demonstrate various algorithm notations and algorithm correctness**. (K2)**
CO2 - Construct various applications based on sorting and tree data structure. **(K2)**
CO3 - Experiment with the performance of various Text Processing operations. **(K3)**
CO4 - Apply graph data structures to the real time applications. **(K3)**
CO5 - Illustrate the performance of the polynomial time algorithm. **(K2)**

UNIT I ALGORITHM NOTATIONS AND REPRESENTATIONS (9 Hrs)

Mathematical Induction - Asymptotic Notations – Algorithm Analysis - NP-Hard and NP-Completeness – Recurrence Equations – Solving Recurrence Equations – Memory Representation of Multi-dimensional Arrays – Time-Space Tradeoffs.

UNIT II SORTING AND TREES (9 Hrs)

Heapsort – Quicksort – Topological sort - Sorting in Linear Time – Elementary Data Structures – Hash Tables – Hash Functions- Binary Search Trees – AVL Trees – Red Black trees – Multi-way Search Trees –B-Trees- Fibonacci Heaps – van Emde Boas Trees – Data Structures for Disjoint Sets.

UNIT III TEXT PROCESSING OPERATIONS (9 Hrs)

Text Processing: String Operations - Brute-Force Pattern Matching - The Boyer-Moore Algorithm - The Knuth-Morris-Pratt Algorithm - Standard Tries - Compressed Tries - Suffix Tries - The Huffman Coding Algorithm - The Longest Common Subsequence Problem (LCS) - Applying Dynamic Programming to the LCS Problem.

UNIT IV GRAPH ALGORITHMS (9 Hrs)

Elementary graph Algorithms – Minimum Spanning Trees – Single Source Shortest Paths- All Pairs Shortest Paths – Maximum Flow - Multithreaded Algorithms – Matrix Operations.

UNIT V LINEAR PROGRAMMING (9 Hrs)

Linear programming – Polynomials and Fast Fourier Transform – Number Theoretic Algorithms – Computational Geometry –NP-Completeness – Approximation Algorithms.

Text Books

1. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, PHI, Third Edition, 2016.

2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, Second Edition, 2004.
3. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, Computational Geometry: Algorithms and Applications, Springer, Third edition, 2008.

Reference Books

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, “Data Structures and Algorithms”, Addison Wesley, Fifth Edition, 2017.
2. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company, Sixth Edition, 2016.
3. Narasimha karumanchi, Data Structures and algorithms made easy, Fifth Edition, 2017.
4. E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, University Press, Fourth Edition, 2007.
5. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, Second Edition, 2002.

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1. https://www.javatpoint.com/data-structure-tutorial/
2. https://www.studytonight.com/data-structures/
3. https://www.tutorialspoint.com/data_structures_algorithms/
4. https://www.w3schools.in/data-structures-tutorial/intro/
5. https://www.geeksforgeeks.org/data-structures/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	1	2	2	3	2	2
2	1	2	2	2	2	2	3	2	2
3	2	3	3	1	3	3	3	3	3
4	2	3	3	1	3	3	3	3	3
5	3	3	3	1	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
P20CST102	**CLOUD AND BIGDATA ANALYTICS**	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To define the fundamental ideas behind Cloud Computing.
- To classify the basic ideas and principles in cloud Infrastructure.
- To define network virtualization and geo-distributed cloud.
- To Understand the Big Data Platform and its Use cases.
- To Provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS

Course Outcomes

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

CO1 - Explain the core concepts of the cloud computing paradigm**.(K3)**

CO2 - Apply fundamental concepts in cloud infrastructures. **(K4)**

CO3 - Illustrate the fundamental concepts of network virtualization and geo-distributed cloud. **(K4)**

CO4 - Identify Big Data and its Business Implications. **(K3)**

CO5 - List the components of Hadoop and Hadoop Eco-System, Access and Process Data on Distributed File System. **(K4)**

UNIT I INTRODUCTION (9 Hrs)

Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Cloud Services - Cloud Service Administration - Cloud Data Management.

UNIT II CLOUD INFRASTRUCTURE (9 Hrs)

Cloud Infrastructure: Introduction - Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups - Standards Bodies and Working Groups – Service Oriented Architecture – Business Process Execution Language – Interoperability Standards for Data Center Management - Utility Computing Technology – Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment - Data Center Challenges and Solutions - Automating the Data Center.

UNIT III NETWORK VIRTUALIZATION AND GEO-DISTRIBUTED CLOUD (9 Hrs)

Cloud computing and server virtualization-networking of virtual machines inside hypervisor – Docker – software defined network – Network virtualization in multi-tenant data centers - VL2 - NVP – Geo distributed cloud data centers.

UNIT IV INTRODUCTION TO BIG DATA AND HADOOP (9 Hrs)

Types of Digital Data - Introduction to Big Data - Big Data Analytics - History of Hadoop - Apache Hadoop - Analysing Data with Unix tools - Analyzing Data with Hadoop - Hadoop Streaming - Hadoop Echo System - IBM Big Data Strategy - Introduction to Ionosphere Big Insights and Big Sheets.

UNIT V HDFS (HADOOP DISTRIBUTED FILE SYSTEM) & MAP REDUCE (9 Hrs)

The Design of HDFS - HDFS Concepts - Command Line Interface - Hadoop file system interfaces - Data flow - Data Ingest with Flume and Scoop and Hadoop archives - Hadoop I/O: Compression – Serialization

Avro and File-Based Data structures. Anatomy of a Map Reduce Job Run – Failures - Job Scheduling - Shuffle and Sort - Task Execution - Map Reduce Types and Formats - Map Reduce Features.

Text Books

1. RajivMisra, Yashwant singh patel, ”Cloud and Distributed Computing: Algorithm and systems”, Wiley, First edition, 2020.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
3. Ritting house, John W., and James F. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

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1. John W. Rittinghouse and James F. Ransome, “Cloud Computing Implementation, Management and Security”, CRC Press, Taylor & Francis Group, Boca Raton London New York, 2010.
2. Alfredo Mendoza, “Utility Computing Technologies, Standards, and Strategies”, Artech House INC, 2007.
3. Bunker and Darren Thomson, “Delivering Utility Computing”, John Wiley & Sons Ltd, 2006.
4. Tom White, “ Hadoop: The Definitive Guide”, O’reily Media, Third Edition, 2012.
5. Pete Warden, “Big Data Glossary”, O’Reily, 2011.

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2. www.redhat.com/en/topics/cloud-computing/what-is-cloud-infrastructure
3. www.digitalocean.com/community/tutorials/an-introduction-to-big-data-concepts-and-terminology
4. https://www.zdnet.com/article/what-is-cloud-computing-everything-you-need-to-know-about-the-cloud/
5. https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	1	2	2	1	-	1	3	-
2	1	1	2	2	1	2	1	-	3
3	2	1	1	2	1	2	1	3	-
4	4	1	2	1	-	1	-	3	1
5	3	1	1	2	-	-	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
P20CST103	**ARTIFICIAL INTELLIGENCE AND AGENT TECHNOLOGY**	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To understand the concepts, techniques and applications of Artificial Intelligence.
- Get an overview of problem solving technique using agent technology
- Acquire an understanding of agent based system development
- Understand the logical representation of organizational methods
- Develop of agent tools and techniques.

Course Outcomes

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

CO1 - Understand the basic concepts techniques and applications of software agents. **(K3)**
CO2 - Design and development of distributed problem Solving techniques. **(K5)**
CO3 - Understand the Knowledge in Multi agent and intelligent agents. **(K2)**
CO4 - Understand the computational organizational theory. **(K2)**
CO5 - Design and apply the development tools and applications of Agents. **(K5)**

UNIT I ARTIFICIAL INTELLIGENCE (9 Hrs)

AI Agents and its structure - Problem solving by searching– Uninformed Search Strategies - Forward and backward chaining - Bayes Rule and its Applications. Bayesian Networks.

UNIT II AGENT TECHNOLOGY AND DISTRIBUTED PROBLEM SOLVING (9 Hrs)

Introduction to Agents – Abstract architectures for intelligent agents – Concrete architecture for intelligent agents – Agent Programming languages Multi-agent Systems and societies of Agents – Agent Communications – Agent Interaction Protocols.

Distributed Problem Solving and Planning – Introduction – Task Sharing – Result Sharing – Distributed Planning – Distributed Planning and Execution.

UNIT III DISTRIBUTED RELATION DECISION MAKING (9 Hrs)

Distributed Relation Decision making – Introduction Evaluation Criteria – Voting – Auctions – Bargaining – General Equilibrium market mechanisms – Contract nets – coalition formation learning in multi-agent system – Learning and activity coordination – Learning about and from other agents – Learning and Communication.

UNIT IV Formal Methods in DAI: Logic-Based Representation and Reasoning (9 Hrs)

Introduction - Logical Background: Basic Concepts, Propositional and Predicate Logic, Modal Logic, Deontic Logic - Dynamic Logic - Temporal Logic. Cognitive Primitives - BDI Implementations - Tools and Systems.

UNIT V AGENTS DEVELOPMENT FRAMEWORKS AND LANGUAGES (9 Hrs)

Agents Development frameworks and languages – Development tools – applications of agents. Agent Oriented methodologies – Agent oriented analysis and design - Gaia methodology – MASE - OPEN process framework - Tropos - Agent UML.

Text Books

1. Stuart Russel, Peter Norvig “Artificial Intelligence – A Modern Approach”, Pearson Education, Third Edition, 2009.
2. Gerhard Weiss, “Multi-agent system – A modern approach to Distributed Artificial Intelligent”, MIT press.
3. Kevin Night, Elaine Rich, Nair B., “Artificial Intelligence (SIE)”,McGraw Hill, 2008.

Reference Books

1. Michael Wooldridge, “Introduction to Multi-agent system”, John Wiley & Sons, Second Edition, 2009.
2. Walter Brenner et al, “Intelligent Software agents”, Springer. Bradshaw, Software Agents, MIT Press, 2000.
3. David L. Poole, Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, First Edition, 2017.
4. M. Tim Jones, Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc, First Edition, 2008
5. Nils J. Nilsson, The Quest for Artificial Intelligence, Cambridge University Press, 2009.

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2. https://www. nptel.ac.in/
3.https://www.reddit.com/r/artificial/
4. http://www.mit.jyu.fi/ai/vagan/ties453.html
5. https://www.tutorialspoint.com/artificial_intelligence/index.htm

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	2	3	3	3	2	3	3	3
2	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	2	3	2	2
4	3	3	3	3	3	3	3	2	2
5	3	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

P20CCT101	RESEARCH METHODOLOGY AND IPR (Common to all M.Tech Programme)	L	T	P	C	Hrs
		2	0	0	2	30

Course Objectives

- To impart knowledge and skills required for research and IPR.
- To understand the various approaches of literature studies and ethics to be done in research.
- To understand the Problem formulation, analysis and solutions, Technical paper writing / presentation without violating professional ethics.
- To understand the nature of IPR, Patent process and applying procedure.
- To analyze the scope of patent rights and developments in IPR.

Course Outcomes

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

CO1- Gain Knowledge to formulate the research problem. **(K2)**

CO2- Understand the concepts to carry out the literature review, ethics and research analysis. **(K2)**

CO3- Explain the way of writing technical paper and presentation methods.**(K2)**

CO4- Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. **(K2)**

CO5- Ability to understand about IPR and filing patents in R & D. **(K3)**

UNIT I RESEARCH PROBLEM FORMULATION (6 Hrs)

Meaning of research problem- Sources of research problem - criteria characteristics of a good research problem - errors in selecting a research problem - scope and objectives of research problem. Approaches of investigation of solutions for research problem - data collection – analysis – interpretation - necessary instrumentations.

UNIT II LITERATURE REVIEW (6 Hrs)

Effective literature studies approaches – analysis – plagiarism and research ethics.

UNIT III TECHNICAL WRITING /PRESENTATION (6 Hrs)

Effective technical writing - how to write report – paper - developing a research proposal - format of research proposal - Presentation and assessment by a review committee.

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR) (6 Hrs)

Nature of Intellectual Property: Patents – Designs - Trade and Copyright. Process of Patenting and Development: Technological research – innovation – patenting - development. International Scenario: International cooperation on Intellectual Property - Procedure for grants of patents - Patenting under PCT.

UNIT V INTELLECTUAL PROPERTY RIGHTS (IPR) (6 Hrs)

Patent Rights: Scope of Patent Rights - Licensing and transfer of technology - Patent information and databases - Geographical Indications - New Developments in IPR - Administration of Patent System - IPR of Biological Systems - Computer Software etc. Traditional knowledge Case Studies - IPR and IITs.

Text Books

1. Stuart Melville and Wayne Goddard, “Research methodology: An introduction for science &amp; Engineering students’, Kenwyn Publisher, 1996.
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”, Lansdowne Publisher, Second Edition, 2001.
3. C.R. Kothari, Gaurav Garg, “Research Methodology: Methods and Techniques”, New Age International, Fourth Edition, 2018.

Reference Books

1. Halbert, “Resisting Intellectual Property”, Taylor &amp; Francis Limited, 2007.
2. Ranjit Kumar, “Research Methodology: A Step by Step Guide for beginners”, Second Edition, 2010.
3. Trochim, “Research Methods: The concise knowledge base”, Atomic Dog Publishing, 2005.
4. Fink A, “Conducting Research Literature Reviews: From the Internet to Paper”, Sage Publications, 2009.

Web References

1. https://www.scribd.com/document/427419672/Research-Methodology-and-Ipr
2. https://www.isical.ac.in/~palash/research-methodology/RM-lec9.pdf
3. https://www.wipo.int/edocs/pubdocs/en/intproperty/958/wipo_pub_958_3.pdf
4. https://lecturenotes.in/m/21513-research-methodology-
5. https://iare.ac.in/sites/default/files/MTECH-CAD.CAM-R18-RM-IP-NOTES.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	2	1	1	2	1	3	3	2
2	3	2	1	1	2	1	3	2	2
3	3	2	1	1	2	1	3	2	2
4	3	2	1	1	3	1	3	2	3
5	3	2	1	1	2	1	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
P20CSP101	**` ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY**	**0**	**0**	**4**	**2**	**45**

Course Objectives

- To learn the advanced concepts of Data Structures and its related applications.
- To learn about the concepts of Heaps and its various categories with operations.
- To study about problems using Tree data structures such as AVL, B-Trees, Red Black tree etc.
- To understand the graph techniques and algorithms to solve the real time applications.
- To analyze the algorithms / program’s efficiency in terms of time and space complexity.

Course Outcomes

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

CO1 - Evaluate the algorithm’s / program’s efficiency in terms of time and space complexity. **(K4)**
CO2 - Solve the given problem by identifying the appropriate Data Structure**. (K3)**
CO3 - Construct various applications based on sorting and tree data structure. **(K2)**
CO4 - Apply graph data structures to solve real time applications such as network flow and linear programming. **(K3)**
CO5 - Illustrate the performance of the polynomial time algorithm. **(K2)**

List of Experiments

1. Implementation of the following Heap Structures.
    a. Min Heap (Insertion, Delete Min, Delete Max)
    b. Skew Heap(Priority Queue operations)
    c. Fibonacci Heap (Priority Queue operations).
2. Implementation of the following Search Structures
    a. AVL Trees (Insertion, Deletion and Search)
    b. Splay Trees (Insertion, Deletion and Search)
    c. B-Trees (Insertion, Deletion and Search)
    d. Red- Black Trees.
3. Implementation of Convex Hull.
4. Implementation of Topological sort.
5. Implementation of Graph search algorithms.
6. Implementation of Randomized algorithms.
7. Implementation and application of network flow and linear programming problems.
8. Implementation of algorithms using the hill climbing and dynamic programming design techniques.
9. Implementation of recursive backtracking algorithms.
10. Implementation of Branch and Bound Algorithms.

Text Books

1. E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, University Press, Fifth Edition, 2007.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, Introduction to Algorithms, PHI/Pearson Education, Third Edition, 2009.

3. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, Wiley India, Second Edition, 2006.

.Reference Books

1. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2016.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson, Second Edition, 2004.
3. Sara Baase and Allen Van Gelder, Computer Algorithms Introduction to Design and Analysis, Pearson Education Asia, Third Edition, 2010.
4. Donald E Knuth, The Art of Computer Programming, Volume I & II, Addison Wesley, Revised Re-Third Edition, 2011.
5. Michael T. Goodrich, Roberto Tamassia, David M. Mount," Data Structures and Algorithms in C++",Wiley, Second Edition, 2011.

Web References

1. https://www.javatpoint.com/data-structure-tutorial/
2. https://www.studytonight.com/data-structures/
3. https://www.tutorialspoint.com/data_structures_algorithms/
4. https://www.w3schools.in/data-structures-tutorial/intro/
5. https://www.geeksforgeeks.org/data-structures/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	3	2	2	3	2	2
2	1	2	2	2	2	2	3	2	2
3	1	3	3	3	3	3	3	3	3
4	2	3	3	3	3	3	3	3	3
5	1	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
P20CCP101	**TECHNICAL REPORT WRITING AND SEMINAR** (Common to all M.Tech Programme)	**0**	**0**	**4**	**2**	**45**

Course Objectives

- Selection of topic based on interest
- Formulate the Objective
- To develop their scientific and technical reading and writing skills that they need to understand and construct research articles.
- To obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas.
- Preparation of report

Course Outcomes

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

CO1 - Select a subject, narrowing the subject into a topic.**(K2)**

CO2 - State an objective and collecting the relevant bibliography (at least 15 journal papers). **(K2)**

CO3- Study the papers and understanding the author's contributions and critically analyzing each paper.**(K3)**

CO4 - Prepare a working outline and linking the papers and preparing a draft of the paper. **(K2)**

CO5- Prepare conclusions based on the reading of all the papers and Writing the Final Paper and giving final Presentation. **(K3)**

Activity	Instructions	Submission week	Evaluation
Selection of area of interest and Topic	Select an area of interest, topic and state an objective	2nd week	**3 %** Based on clarity of thought, current relevance and clarity in writing
Stating an Objective			
Collecting Information about area & topic	1. List 1 Special Interest Groups or professional society 2. List 2 journals 3. List 2 conferences, symposia or workshops 4. List 1 thesis title 5. List 3 web presences (mailing lists, forums, news sites) 6. List 3 authors who publish regularly in your area 7. Attach a call for papers (CFP) from your area.	3rd week	**3%** (the selected information must be area specific and of international and national standard)
Collection of Journal papers in the topic in the context of the objective – collect 20 & then filter	• provide a complete list of references you will be using- Based on your objective -Search various digital libraries and Google Scholar • When picking papers to read - try to: - Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of	4th week	**6%** (the list of standard papers and reason for selection)

	them. - Favour papers from well-known journals and conferences, in the field (as indicated in other Favour more recent papers, - Pick a recent survey of the field so you can quickly gain an overview, Find relationships with respect to each other and to your topic area(classification scheme/categorization) - Mark in the hard copy of papers whether complete work or section/sections of the paper are being considered		
Reading and notes for first 5 papers	**Reading Paper Process** For each paper form a Table answering the following questions: - What is the main topic of the article? - What was/were the main issue(s) the author said they want to discuss? - Why did the author claim it was important? - What simplifying assumptions does the author claim to be making? - What did the author do? - How did the author claim they were going to evaluate their work and compare it to others? - What did the author say were the limitations of their research? - What did the author say were the important directions for future research? - Conclude with limitations/issues not addressed by the paper (from the perspective of survey)	6th week	8% (The table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)
Reading and notes for next 5 papers	Repeat Reading Paper Process	7th week	8% (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper
Draft outline 1 and Linking papers	Prepare a draft Outline, your survey goals, along with a classification / categorization diagram	8th week	8% (this component will be evaluated based on the linking and classification among the papers)

Abstract	Prepare a draft abstract and give a presentation	9th week	6%(Clarity, purpose and conclusion) 6% Presentation & Viva Voce
Introduction Background	Write an introduction and background sections	10th week	5% (clarity)
Sections of the paper	Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey	11th week	10% (this component will be evaluated based on the linking and classification among the papers)
Conclusions	Write your conclusions and future work	12th week	5% (conclusions)
Final Draft	Complete the final draft of your paper	13th week	10% (formatting, English, Clarity and linking) 4% Plagiarism Check Report
Seminar	A brief 15 slides on your paper	14th & 15th week	10% (based on presentation and Vivavoce)

COs/POs/PSOs Mapping

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1	2	3	3	1	3	3	2	1	2
2	2	3	2	1	3	2	2	1	2
3	2	3	2	1	3	2	2	1	2
4	2	3	2	1	3	2	2	1	2
5	2	3	2	1	3	2	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

P20CSC1XX	EMPLOYABILITY ENHANCEMENT COURSES	L	T	P	C	Hrs
		0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

		L	T	P	C	Hrs
P20CST204	**IOT AND EDGE COMPUTING**	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To assess the vision and use of devices in IoT Technology
- To understand IoT Market perspective.
- To classify Real World IoT Design Constraints, Industrial Automation in IoT.
- To learn about the Edge Computing
- To know about Physical Servers and Cloud Offerings

Course Outcomes

After completion of the course, students will be able to

CO1 - Interpret the vision of IoT from a global context along with the uses of IOT devices**. (K2)**
CO2 - Determine the Market perspective of IoT. **(K2)**
CO3 - Design a portable IOT using Raspberry Pi. **(K3)**
CO4 – Describe the importance of edge computing. **(K2)**
CO5 - Illustrate the applications in Industrial Automation and identify Real World Design Constraints. **(K2)**

UNIT I INTRODUCTION AND ENABLING TECHNOLOGIES (9 Hrs)

Definition and Characteristics - Physical Design - Things in IoT- Protocols, Logical Design - Communication Models - Communication APIs - Difference between IoT and M2M - SDN and NFV for IoT - Software Defined Networking - Network Function Virtualization - System Management with NETCONF-YANG - Need for IoT Systems Management - Network Operator Requirements – NETCONF - YANG.

UNIT II IOT PROTOCOLS (9 Hrs)

IoT Access Technologies: Physical and MAC layers - topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT - From 6LoWPAN to 6Lo - Routing over Low Power and Lossy Networks – Application Transport Methods- Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III IOT PLATFORMS DESIGN METHODOLOGY (9 Hrs)

IoT Physical Devices and Endpoints – Introduction to Raspberry PI - Interfaces (Serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets - Controlling output -Reading input from pins.

UNIT IV INTRODUCTION TO EDGE COMPUTING (9 Hrs)

Fog computing vs Edge computing - Need for edge computing - benefits of Edge computing. Lightweight Container Middleware for Edge Cloud Architectures - Clusters for Lightweight Edge Clouds - Architecture Management – Storage and Orchestration - IoT Integration - Security Management for Edge Cloud Architectures.

UNIT V PHYSICAL SERVERS AND CLOUD OFFERINGS (9 Hrs)

Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Web Server – Web server for IoT - Cloud for IoT - Python web application framework - Designing a RESTful web API.

Text Books

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things: A Hands-on Approach”, VPT, First edition, 2014.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, Second Edition, 2012.
3. Rajkumar Buyya, Satish Narayana Srirama “Fog and Edge Computing: Principles and Paradigms”, Wiley-Blackwell, First Edition, 2019.
4. Arshdeep Bahga and Vijay Madisetti, “Internet of Things – A Hands-on Approach”, Universities Press, 2015.
5. Matt Richardson & Shawn Wallace, “Getting Started with Raspberry Pi”, O’Reilly (SPD), Third Edition, 2016.

Reference Books

1. Jonathan Follett, “Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies”, O’Reilly, First Edition, 2014.
2. Charalampos Doukas, “Building Internet of Things with the Arduino”, Create space Publishers, 2012.
3. Donald Norris, “The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black”, Mc.Graw Hill, First Edition, 2015.
4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, “From Machine-to-Machine to the Internet of Thing – Introduction to a New Age of Intelligence”, Elsevier, 2014.
5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
6. Michael Margolis, Arduino Cookbook, “Recipes to Begin, Expand, and Enhance Your Projects”, O’Reilly Media, Second Edition, 2011.

Web References

1. https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot
2. https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
3. https://www.geeksforgeeks.org/edge-computing/
4. https://www.i-scoop.eu/internet-of-things-guide/edge-computing-iot/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	1	2	1	1	-	2	1	-
2	2	1	2	1	-	-	2	-	-
3	2	1	2	1	-	-	2	1	-
4	2	1	2	1	-	-	2	1	-
5	2	1	2	1	1	-	2	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

P20CST205	` ADHOC AND WIRELESS SENSOR NETWORKS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about the issues in the design of wireless ad hoc networks.
- To understand the working of protocols in different layers of mobile ad hoc and sensor networks.
- To expose the students to different aspects in sensor networks.
- To understand various security issues in ad hoc and sensor networks and solutions to the issues.
- To learn the Channel allocation mechanism for various on-demand applications using Ad-Hoc Networks.

Course Outcomes

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

CO1 – Identify different issues in wireless ad hoc and sensor networks. **(K1)**
CO2 - Analyze protocols developed for ad hoc and sensor networks. **(K4)**
CO3 - Identify and understand security issues in ad hoc and sensor networks. **(K1)**
CO4 - Build the routing mechanism and improving QoS. **(K3)**
CO5 - Apply Channel allocation strategy to improve the connectivity in Ad-Hoc Networks. **(K3)**

UNIT I INTRODUCTION (9 Hrs)

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel - mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs): concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS (9 Hrs)

Issues in designing a MAC Protocol - Classification of MAC Protocols - Contention based protocols - Contention based protocols with Reservation Mechanism - Contention based protocols with Scheduling Mechanisms – Multi channel MAC - IEEE 802.11.

UNIT III ROUTING PROTOCOLS TRANSPORT LAYER IN ADHOC NETWORKS (9 Hrs)

Issues in designing a routing and Transport Layer protocol for Ad hoc networks - proactive routing, reactive routing (on-demand) - hybrid routing - Classification of Transport Layer solutions -TCP over Ad hoc wireless Networks.

UNIT IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS (9 Hrs)

Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies - MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC - IEEE 802.15.4.

UNIT V WSN ROUTING, LOCALIZATION & QOS (9 Hrs)

Issues in WSN routing – OLSR - Localization – Indoor and Sensor Network Localization - absolute and relative localization, triangulation - QOS in WSN - Energy Efficient Design – Synchronization - Transport Layer issues.

Text Books

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, Third Edition, 2008.
2. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", O'Reilly Publishers, First Edition, 2007.
3. Al-Sakib Khan Pathan, Shafiullah Khan, Nabil Ali Alrajeh, "Wireless Sensor Networks Current Status and Future Trends", CRC Press, 2016.

Reference Books

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, Second Edition, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, Third Edition, 2005.
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, Fourth Edition, 2007.
5. Anna Hac, "Wireless Sensor Network Designs", John Wiley, Second Edition,2003.

Web References

1. https://nptel.ac.in/courses/106105160/
2. https://en.wikipedia.org/wiki/Wireless_ad_hoc_network
3. https://shodhganga.inflibnet.ac.in/bitstream/10603/77730/12/12_chapter_02.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-
2	3	2	3	3	-	1	-	2	-
3	3	1	3	3	-	1	2	2	-
4	1	1	2	3	3	1	-	2	-
5	2	1	2	3	2	3	2	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	**T**	**P**	**C**	**Hrs**
P20CST206	**INTERNALS OF OPERATING SYSTEMS**	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To read and understand sample open source programs and header files.
- To learn how the processes are implemented in Linux.
- To understand the implementation of the inter process communication in Linux.
- To study windows operating systems and algorithms.
- To know the components and management aspects of Real time and Mobile operating systems.

Course Outcomes

After completion of the course, students will be able to

CO1 - Explain the functionality of an operating system by reading its internal source. **(K2)**
CO2 - Revise any algorithm present in an internal system namely system calls. **(K1)**
CO3 - Describe the implementation of inter process communication. **(K2)**
CO4 - Modify and use the data structures of the windows operating system. **(K3)**
CO5 - Identify the different features of real time and mobile operating systems. **(K3)**

UNIT I INTRODUCTION TO KERNEL (9 Hrs)

Introduction to Kernel - Architecture of the UNIX operating system - System concepts - Data structures. Buffer Cache: Buffer header - Structure of Buffer pool - Reading and writing disk blocks. Files INODES - Structure of a regular file - Directories- Super block- Inode assignment.

UNIT II SYSTEM CALLS (9 Hrs)

System calls: OPEN-Read – Close – Write – Create – CHMOD – CHOWN – Pipes - Mounting and Unmounting. Process: Layout the system memory – Context - Process control - process creation – signals - Process scheduling – time - clock.

UNIT III INTER-PROCESS COMMUNICATIONS (9 Hrs)

Inter-Process Communications: Process tracing- System V IPC-Shared Memory - Semaphores. Network Communications: Socket programming – Sockets – descriptors – Connections - Socket elements - Stream and Datagram Sockets.

UNIT IV WINDOWS OPERATING SYSTEM (9 Hrs)

Windows Operating system: versions - Concepts and tools - Windows internals - System Architecture - Requirements and design goals - Operating system mode l- Architecture overview - Key system components. System mechanisms: Trap dispatching - object manager – Synchronization - System worker threads -Windows global flags - Local procedural calls - Kernel event tracing.

UNIT V REAL TIME AND MOBILE OPERATING SYSTEMS (9 Hrs)

Basic Model of Real Time Systems – Characteristics - Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems - Micro Kernel Design - Client Server Resource Access - Processes and Threads -Memory Management - File system.

Text Books

1. Maurice J. Bach, “The Design of the Unix Operating System”, Prentice Hall of India, First Edition 1991.
2. Brian Catlin, Jamie Hanrahan, Mark E. Russinovich, David A. Solomon and Alex Ionescu “Windows Internals, Book 1 – User Mode 7ed (Developer Reference)”, Microsoft Press, Seventh Edition, 2014.
3. William Stallings, “Operating Systems: Internals and Design Principles”, Pearson Education, Fifth Edition, 2019.
4. MukeshSinghal and Niranjan G. Shivaratri, Advanced Concepts in Operating Systems - Distributed, Database, and Multiprocessor Operating Systems, Tata McGraw-Hill, Fifth Edition, 2001.

Reference Books

1. Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", O'Reilly Publications, Third Edition, 2005.
2. Harold Abelson, Gerald Jay Sussman and Julie Sussman, “Structure and Interpretation of Computer Programs”, Universities Press, Second Edition, 2013.
3. Michael Beck, Harald Bohme, MirkoDziadzka, Ulrich Kunitz, Robert Magnus, Dirk Verworner, “Linux Kernel Internals”, Addison-Wesley, Third Edition, 2017.
4. Robert Love, “Linux Kernel Development”, Addison-Wesley, Third Edition, 2010.
5. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System concepts, John Wiley & Sons, Tenth Edition (kindle edition), 2018.

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1. http://www.softpanorama.org/Internals/index.shtml
2. https://www.udemy.com/course/understanding-the-internals-of-the-unix-kernel-architecture/
3. https://www.britannica.com/technology/Windows-OS
4. https://www.tutorialspoint.com/operating_system/index.htm
5. https://www.geeksforgeeks.org/operating-systems/

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3	2	2	3	3	2	-	2	1	1
4	2	2	3	3	2	-	1	1	2
5	2	2	3	3	2	3	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

P20CST207

AGILE AND SOFTWARE PROJECT MANAGEMENT

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies.
- To create a planning and scheduling.
- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To understand agile development and testing.

Course Outcomes

After completion of the course, students will be able to

CO1 - Apply systematic procedure for software design and deployment. **(K2)**
CO2 - Completely analyse the required framework model. **(K1)**
CO3 - To fulfil the resource utilization. **(K1)**
CO4 - Develop techniques and tools for improving team collaboration along software requirement with Agility. **(K3)**
CO5 - Construct Software process improvement as an ongoing task for development teams. **(K2)**

UNIT I SOFTWARE PROJECT MANAGEMENT (9 Hrs)

Project Management – Activities Methodologies – Categorization of Software Projects – Setting Objective – Management Principles – Management Control – Project portfolio Management – Cost benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT II SOFTWARE PROCESS MODEL AND TECHNIQUES (9 Hrs)

Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Extreme Programming – SCRUM – Basics of Software estimation – Effort and Cost estimation techniques – Staffing Pattern- Software process Techniques - Project schedules – Activities – Sequencing and scheduling – Network Planning models– Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules.

UNIT III SOFTWARE PROJECT MANAGEMENT ORGANISATION AND CONTROL (9 Hrs)

Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Managing people – Organizational behaviour – Best methods of staff selection – Motivation – The Oldham Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.

UNIT IV AGILE METHODOLOGY (9 Hrs)

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile

Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT V AGILITY IN REQUIREMENT ENGINEERING AND QUALITY ASSURANCE (9 Hrs)

Agile Information Systems – Agile Decision Making - Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Impact of Agile Processes in Requirement Engineering – Current Agile Practices - Agile Requirements Prioritization – Agile Requirements Modeling and Generation - Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development

Text Books

1. Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management", Tata McGraw Hill, Fifth Edition, New Delhi, 2012.
2. Robert K. Wysocki, "Effective Software Project Management", Wiley Publication, Second Edition, 2011.
3. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, Fourth Edition, 2003.

Reference Books

1. Walker Royce, "Software Project Management", Addison-Wesley, First Edition, 1998.
2. Gopalaswamy Ramesh, "Managing Global Software Projects", McGraw Hill Education (India), Fourteenth Reprint, 2013.
3. Craig Larman, "Agile and Iterative Development: A Managers Guide", Addison-Wesley, Third Edition, 2004.
4. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, Second Edition, 2007.
5. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, Second Edition, 2009.

Web References

1. https://www.javatpoint.com/software-project-management
2. http://www.tutorialsspace.com/Software-Engineering/14-Project-Management-Concept-1.aspx
3. http://www.rspa.com/spi/project-mgmt.html
4. https://www.agilealliance.org/agile101/
5. https://www.visual-paradigm.com/scrum/what-is-agile-software-development/
6. https://www.cprime.com/resources/what-is-agile-what-is-scrum/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	3	3	2	2	-	3	2	-
2	3	3	2	2	2	-	3	2	-
3	3	3	2	2	2	-	3	2	-
4	3	3	2	2	2	-	3	2	-
5	3	3	2	2	2	-	3	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 - High

P20CSP202	**` INTERNET OF THINGS LABORATORY**	**L**	**T**	**P**	**C**	**Hours**
		0	**0**	**4**	**2**	**45**

Course Objectives

- To study different communication protocols used in IoT applications.
- To study different sensors used in IoT applications.
- To understand the working of automation systems.
- To understand the working principle of IoT devices using ARDUINO.
- To understand the working principle of IoT devices using RASPBERRY PI.

Course Outcomes

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

CO1 – Illustrate the communication protocols in the IoT domain. **(K1)**
CO2 - Make use of Sensors, Embedded Systems, Networking and Circuits. **(K2)**
CO3 – Construct Industry and Home automation. **(K2)**
CO4 – Build IoT applications using ARDUINO. **(K3)**
CO5 - Construct IoT applications using RASPBERRY PI. **(K2)**

List of Experiments

IOT USING ARDUINO AND ESP MODULE

1. Study of Embedded System, Arduino, C Programming, UART Communication, REST and HTTP protocols, PUSH, PUT and GET commands.

2. Develop a Human detection system using an IR sensor and write received data from Arduino to PC through Serial.

3. Develop an Intelligent Traffic Light system, which gets ultrasonic sensor reading for identifying trespassers with understanding on Arduino Read and Write commands.

4. Develop an Industrial automation system, which runs 2 motor using a Motor Driver based inputs given on Serial monitor inputs from PC and displays the motor operation in Serial Monitor.

5. Develop an Industrial Monitoring system, which constantly senses and plots the reading of a moisture sensor in thinkspeak server and provides buzzer alarm when the value reaches a threshold connected via Arduino with an ESP Module.

6. Develop a Home Automation system consisting of 2 push switches, a LED, and a fan(motor), which constantly uploads value to thinkspeak server.

IOT USING RASPBERRY PI

7. Study of Raspberry Pi, Linux CLI, Raspbian OS, Python programming basics, Difference between Arduino and Python, Advantages

8. Develop a Smart Home using raspberry Pi, and control 2 LEDs through thinkspeak server

9. Develop a Weather Monitoring system using Raspberry Pi, consisting of moisture and Humidity sensor connected to thinkspeak server

10. Develop a Smart Water Management system, to indicate and alert users of available water in tank using a moisture sensor connected to Raspberry Pi through Think speak server.

Text Books

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things: A Hands-on Approach", VPT, First edition, 2014.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, Second Edition, 2012.
3. Rajkumar Buyya, Satish Narayana Srirama "Fog and Edge Computing: Principles and Paradigms", Wiley-Blackwell, First Edition, 2019.
4. Arshdeep Bahga and Vijay Madisetti, "Internet of Things – A Hands-on Approach", Universities Press, 2015.
5. Matt Richardson & Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), Third Edition, 2016.

Reference Books

1. Jonathan Follett, "Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies", O'Reilly, First Edition, 2014.
2. Charalampos Doukas, "Building Internet of Things with the Arduino", Create space Publishers, 2012.
3. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black", Mc.Graw Hill, First Edition, 2015.
4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Thing – Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
6. Michael Margolis, Arduino Cookbook, "Recipes to Begin, Expand, and Enhance Your Projects", O'Reilly Media, Second Edition, 2011.

Web References

1. https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot
2. https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
3. https://www.geeksforgeeks.org/edge-computing/
4. https://www.i-scoop.eu/internet-of-things-guide/edge-computing-iot/

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COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	-	2	2	1	-	2	-	-
2	2	-	2	2	1	-	2	-	-
3	3	1	2	3	3	1	3	3	1
4	3	1	2	3	3	1	3	3	1
5	3	1	2	3	3	1	3	3	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
P20CCP202	**SEMINAR ON ICT: A HANDS-ON APPROACH** (Common to all M.Tech Programme)	**-**	**-**	**4**	**2**	**45**

Course Objectives

- To develop their technical reading and presentation skills that they need to understand and present using ICT Tools.
- To obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and practice to present.

Course Outcomes

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

CO1 - Select a topic, narrowing the topic into presentation.
CO2 - State an objective and use the relevant ICT tools to make the presentation effective.
CO3 - Study the topic and understanding the contributions and prepare report.
CO4 - Prepare a working demo.
CO5 - Prepare conclusions based on the reading of the topic and giving final Presentation.

The methodology used is “learning by doing”, a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

ICT skills

- Understand ICT workflow in the respective domain choosed.
- Manage multitasking.
- Deal with main issues using tech in class.
- Record, edit and deliver audio and video.
- Automate assessments and results.

Scope

- Perspective in order to design activities in class.
- Understand the process of creating audiovisuals.

Teaching tools

- Different ways to create audiovisual activities.
- Handle audiovisual editors.
- Collaborative working.
- Individualize learning experience.
- Get instant feedback from students.

Each one of the students will be assigned an ICT Topic and the student has to conduct a detailed study on the assigned topic and prepare a report, running to 30 or 40 pages for which a demo to be performed followed by a brief question and answer session. The demo will be evaluated by the internal assessment committee (comprising of the Head of the Department and two faculty members) for a total of 100 marks.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	-	3	1	1	3	3	3	2	1
2	-	3	1	1	3	2	3	2	1
3	-	3	1	1	3	2	3	2	1
4	-	3	1	1	3	2	3	2	1
5	-	3	1	1	3	2	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

		L	T	P	C	Hrs
P20CSC2XX	**EMPLOYABILITY ENHANCEMENT COURSES**	**0**	**0**	**4**	**-**	**50**

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.