Department of Computer Science and Business Systems

Minutes of Board of Studies

The first Board of Studies meeting of Department of Computer Science and Business Systems (CSBS) was held on 17th July 2020 at 10:00 A.M in the Lecture Hall, Department of CSBS, 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. G.Shanmugasundaram** Professor and Head, Department of CSBS, SMVEC. Puducherry	Chairman	
External Members			
2	**Dr. K.Devaki, M.E., Ph.D.,** Professor, Department of Computer Science and Engineering, Rajalakshmi Engineering College, Chennai.	Subject Expert	
3	**Dr. M.Chinnadurai, M.E., Ph.D.,** Professor, Department of Computer Science and Engineering, Controller of Examination, E.G.S Pillay Engineering College, Nagapattinam, Tamil Nadu	Subject Expert	
4	**Dr.T. Chithralekha, M.Tech., Ph.D** Professor and Dean , School of Engineering and Technology Pondicherry University, R.V.Nagar, Kalapet, Puducherry	Subject Expert	
5	**Mr. Asoke Das Sarma** BPO Transformation Lead, Tata Consultancy Services, Kolkata.	Industry Member	
6	**Dr. P. Victer Paul, M.Tech., Ph.D.,** Assistant Professor, Department of Computer Science and Engineering, Indian Institute of Information Technology Kottayam, Pala, Kottayam - 686635, Kerala.	Alumni Member	

Internal Members			
7	**Dr. N.S.N. Callassame, M.B.A,Ph.D.,** Professor and Head Department of Management Studies, SMVEC.	Member	
8	**Mr.R. Saravanan , M.E., (Ph.D.),** Associate Professor IT Department, SMVEC.	Member	
9	**Mrs.N. Thilagavathi, M.Tech., Ph.D.,** Associate Professor IT Department, SMVEC	Member	
10	**Dr. K.Deepa Thilak, M.E., Ph.D.,** Associate Professor Department of Computer Science and Business Systems, SMVEC.	Member	
Co-opted Members			
11	**Dr.G. Suresh** Professor, Dept of Mathematics, SMVEC	Member	
12	**Dr.D. Jaichithra** Professor, Dept. of English,SMVEC	Member	
13	**Dr. T. Jayavardhanan** Professor ,Dept. of Physics,SMVEC	Member	

Agenda of the Meeting

1) Introduction about the Institution and Department.
2) To discuss major highlights of Regulation 2020.
3) Uniqueness of the Curriculum of B.Tech – Computer Science and Business Systems.
4) To discuss and approve Curriculum for I to VIII Semester
5) To discuss Syllabi for I and II semester for the UG Programme: B.Tech. Degree Computer Science and Business Systems in the AY 2020-21 for the students admitted in the year 2020-21.
6) To discuss and approve Evaluation Systems
7) To discuss about the Innovative Teaching / Practices Methodology adopted to handle the emerging. / Advanced Technological concept courses.
8) To discuss and approve the panel of examiners.
9) Any other item with the permission of chair

Minutes of the Meeting

Dr.G.Shanmugasundaram, Chairman, BoS officially announced the opening of the meeting, and our Director cum Principal welcomed and introduced the external, 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	Our college Vision, Mission, credentials and programmes offered was briefed to the committee members. Department Vision and Mission was briefed and discussed. The members approved and recommended the same to Academic Council.
Item:2	Regulation 2020 were introduced and discussed with the expert members and the members suggested the following points • Increase the credit points for practical courses • Same course code could be adopted if a Course has both Theory and Practical. The expert members recommended Regulation 2020 with the above suggestions to the Academic Council
Item:3	The uniqueness of the curriculum was presented and was appreciated by the BoS members.
Item:4	The BoS members approved the curriculum from I to IV semesters with minor corrections and recommended to Academic council **Basic Science Courses** • Split the Introductory topics in Statistics, probability and calculus course into two courses , one as probability and statistics and other as Calculus **Management Courses** • Fundamentals of Business & Management to be brought to earlier semesters like 3rd or 4th The BoS members recommended the curriculum with following changes from V to VIII semesters and submitted to Academic council for approval. **Management Courses** • Financial Management, IP and Entrepreneurship courses shall be moved to later semesters like 5th and 6th. • As the programme focus on Business Systems, experts suggested the courses like Business Intelligence, Business System Analytics, Business Process, Ecommerce and Payment Gateways and Blockchain as part of curriculum to improve the students' knowledge in that domain. **Professional Core Courses** • Laboratory integrated Theory Courses may be introduced • Questioned the need for compiler design course and asked to discuss the need • Design thinking course shall be moved to later semesters (7th or 8th) and related with respective to business systems • IT Workshop Matlab/scilab course shall be replaced with the associated theory Course and the Practical to remain unchanged but applications based on the theory course introduced shall be included • Replacement of course Information Security with business system security or financial systems security **Elective Courses** • Courses like Data mining and Analytics, Internet of Things shall be changed to core course • The courses Cognitive science and analytics and Cryptology may be changed to Business system related courses

	• Course named Advanced Social, Text and Media Analytics shall be split into two course like Social Media Analytics or Privacy in Online social media etc., **Mandatory Courses** • Number of Courses shall be reduced and refined
Item:5	The BoS members recommended the following changes to be made in the Syllabi for I and II Semesters and submitted to Academic council for approval **Semester I,** Course Name - Introductory Topics In Statistics, Probability and Calculus • Concentrate only in Statistics and Probability and Calculus shall be moved to Linear Algebra Course in the second semester. **Semester II,** Course Name - Linear Algebra • The topic Machine Learning component (unit V) falls out of place in this course and Calculus shall be included instead.
Item:6	The BoS members recommended the weightage given to internal marks shall be increased, as Choice Based Credit System insists 40:60 weightage for internal and external respectively with the consent of Academic council
Item:7	Train The Trainer (TTT) model, ICT tools and teaching Pedagogy were discussed and BOS members appreciated it
Item:8	The BoS members recommended and approved the panel of examiners to Academic Council

The meeting was concluded at 12:00 noon with vote of thanks by **Dr. G. Shanmugasundaram**, Head of the Department, Computer Science and Business Systems.

Dr. G. Shanmugasundaram
HOD/CSBS
Chairman-BOS (CSBS)

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

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B. TECH.
COMPUTER SCIENCE AND BUSINESS SYSTEMS

ACADEMIC REGULATIONS 2020
(R-2020)

CURRICULUM

COLLEGE VISION AND MISSION

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 the growth of society

DEPARTMENT VISION AND MISSION

Vision

To envision the technology and business trends in this domain and to create technically competent professionals for meeting out the needs globally

Mission

M1: To foster knowledge sharing through contemporary curriculum and creative teaching learning process

M2: To impart strong computer and business skills to shine and sustain in the agile IT industry

M3: To promote technocrats with rich expertise in innovation and research

M4: To instill moral values and ethical responsibilities by empowering graduates to be socially responsible

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge:

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

PO2: Problem analysis:

Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions:

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

PO4: Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society:

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

PO7: Environment and sustainability:

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

PO8: Ethics:

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

PO9: Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication:

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

PO11: Project management and finance:

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

PO12: Life-long learning:

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To apply computer science and management concepts to solve the real world problems

PEO2: To develop professional skills in contemporary areas of computer science and business systems to obtain employability and pursue higher education

PEO3: To reconcile business demands with state-of-the art technologies by providing innovative solutions and insightful decisions

PEO4: To ensure ample growth with social and ethical responsibilities

PROGRAMME SPECIFIC OBJECTIVES (PSOs)

PSO1: Ability to gain deep knowledge in Computer Science with equal appreciation in humanities, management, sciences and human values.

PSO2: Ability to demonstrate the technical and organizational skills and provide solutions for the societal needs

PSO3: Ability to engage lifelong learning and bestow innovative contributions to enhance research in the field of computer science and business system

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME

Sl.No	Course Category	Breakdown of Credits
1.	Humanities and Social Sciences (HS)	37
2.	Basic Sciences (BS)	25
3.	Engineering Sciences (ES)	10
4.	Professional core (PC)	56
5.	Professional Electives (PE)	22
6.	Open Electives (PE)	-
7.	Project work/ Internship	12
8.	Employability Enhancement Courses (EEC)*	-
9.	Mandatory Courses (MC)*	-
	Total	**162**

SCHEME OF CREDIT DISTRIBUTION - SUMMARY

Sl.No	Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences (HS)	2	4	-	5	7	5	4	10	37
2	Basic Sciences(BS)	10	8	4	3	-	-	-	-	25
3	Engineering Sciences (ES)	7	3	-	-	-	-	-	-	10
4	Professional Core (PC)	-	4	14	11	9	12	6	-	56
5	Professional Electives (PE)	-	-	-	-	4	4	7	7	22
6	Open Electives (OE)	-	-	-	-	-	-	-	-	-
7	Project Work (PW)	-	-	-	-	-	-	2	8	10
8	Internship(PW)	-	-	-	-	-	2	0	-	02
9	Employability Enhancement Courses (EEC)*	-	-	-	-	-	-	-	-	-
10	Mandatory courses (MC)*	-	-	-	-	-	-	-	-	-
Total		**19**	**19**	**18**	**19**	**20**	**23**	**19**	**25**	**162**

**** EEC and MC are not included for CGPA calculation***

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20HST101	Business Communication & Value Science - I	HS	1	0	2	2	25	75	100
2	U20BST102	Discrete Mathematics	BS	2	2	0	3	25	75	100
3	U20BST103	Introductory Topics in Statistics and Probability	BS	3	0	0	3	25	75	100
4	U20BST113	Physics for Computing Science	BS	3	0	0	3	25	75	100
5	U20EST134	Fundamentals of Computer Science	ES	3	0	0	3	25	75	100
6	U20EST136	Principles of Electrical Engineering	ES	2	0	0	2	25	75	100
Practical										
7	U20BSP114	Physics for Computing Science Laboratory	BS	0	0	2	1	50	50	100
8	U20ESP135	Fundamentals of Computer Science Laboratory	ES	0	0	2	1	50	50	100
9	U20ESP137	Principles of Electrical Engineering Laboratory	ES	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CBC1XX	Certification Course-I **	EEC	0	0	4	-	100	-	100
Mandatory Course										
11	U20CBM101	Induction Program	MC	3Weeks			-	-	-	-
							19	400	600	1000

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20HST202	Business Communication & Value Science – II	HS	2	0	0	2	25	75	100
2	U20HST203	Fundamentals of Economics	HS	2	0	0	2	25	75	100
3	U20BST216	Linear Algebra	BS	3	2	0	4	25	75	100
4	U20BST217	Statistical Methods	BS	3	0	0	3	25	75	100
5	U20EST251	Principles of Electronics	ES	2	0	0	2	25	75	100
6	U20CBT201	Data Structures & Algorithms	PC	2	2	0	3	25	75	100
Practical										
7	U20BSP218	Statistical Methods Laboratory	BS	0	0	2	1	50	50	100
8	U20ESP252	Principles of Electronics Laboratory	ES	0	0	2	1	50	50	100
9	U20CBP201	Data Structures & Algorithms Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CBC2XX	Certification Course - II**	EEC	0	0	4	-	100	-	100
11	U20CBS201	Skill Development Course 1 - Demonstration of Workshop Practices	EEC	0	0	2	-	100	-	100
Mandatory Course										
12	U20CBM202	Environmental Sciences	MC	2	0	0	-	100	-	100
							19	600	600	1200

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST328	Computational Statistics	BS	3	0	0	3	25	75	100
2	U20CBT302	Formal Language and Automata Theory	PC	3	0	0	3	25	75	100
3	U20CBT303	Computer Organization & Architecture	PC	3	0	0	3	25	75	100
4	U20CBT304	Object Oriented Programming	PC	3	0	0	3	25	75	100
5	U20CBT305	Software Engineering	PC	3	0	0	3	25	75	100
Practical										
6	U20BSP329	Computational Statistics Laboratory	BS	0	0	2	1	50	50	100
7	U20CBP302	Object Oriented Programming Laboratory	PC	0	0	2	1	50	50	100
8	U20CBP303	Software Engineering Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
9	U20CBC3XX	Certification Course - III**	EEC	0	0	4	-	100	-	100
10	U20CBS302	Skill Development Course 2*	EEC	0	0	2	-	100	-	100
Mandatory Course										
11	U20CBM303	Physical Education	MC	0	0	2	-	100	-	100
							18	575	525	1100

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20HST404	Business Communication & Value Science – III	HS	2	0	0	2	25	75	100
2	U20HST405	Introduction to Innovation, IP Management & Entrepreneurship	HS	3	0	0	3	25	75	100
3	U20BST440	Operations Research	BS	2	0	0	2	25	75	100
4	U20CBT406	Operating Systems	PC	3	0	0	3	25	75	100
5	U20CBT407	Database Management Systems	PC	3	0	0	3	25	75	100
6	U20CBT408	Software Design with UML	PC	2	0	0	2	25	75	100
Practical										
7	U20BSP441	Operations Research Laboratory	BS	0	0	2	1	50	50	100
8	U20CBP404	Operating Systems(Unix) Laboratory	PC	0	0	2	1	50	50	100
9	U20CBP405	Software Design with UML Laboratory	PC	0	0	2	1	50	50	100
10	U20CBP406	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CBC4XX	Certification Course - IV**	EEC	0	0	4	-	100	-	100
12	U20CBS403	Skill Development Course 3*	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U20CBM404	NSS	MC	0	0	2	-	100	-	100
							19	650	650	1300

SEMESTER – V										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20HST507	Fundamentals of Management	HS	2	0	0	2	25	75	100
2	U20HST508	Business Strategy	HS	2	0	0	2	25	75	100
3	U20HST509	Design Thinking	HS	2	0	2	3	25	75	100
4	U20CBT509	Design And Analysis of Algorithms	PC	3	0	0	3	25	75	100
5	U20CBT510	Compiler Design	PC	3	0	0	3	25	75	100
6	U20CBE5XX	Professional Elective I#	PE	2	2	0	3	25	75	100
Practical										
7	U20CBP507	Design And Analysis of Algorithms Laboratory	PC	0	0	2	1	50	50	100
8	U20CBP508	Compiler Design Laboratory	PC	0	0	2	1	50	50	100
9	U20CBP509	Mini Project	PC	0	0	2	1	50	50	100
10	U20CBEP5X	Professional Elective I# Laboratory	PE	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CBC5XX	Certification Course-V**	EEC	0	0	4	-	100	-	100
12	U20CBS504	Skill Development Course 4: Foreign Language/ IELTS-I	EEC	0	0	2	-	100	-	100
13	U20CBS505	Skill Development Course 5: Presentation Skills Using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U20CBM505	Indian Constitution	MC	2	0	0	-	100	-	100
							20	750	650	1400

 # Professional Electives are to be selected from the list given in Annexure I
**** Certification courses are to be selected from the list given in Annexure II**
*** Skill Development Courses (2 and 3) are to be selected from the list given in Annexure III**

SEMESTER – VI											
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory											
1	U20HST610	Business Communication & Value Science – IV	HS	2	0	2	3	25	75	100
2	U20HST611	Financial and Cost Accounting	HS	2	0	0	2	25	75	100
3	U20CBT611	Computer Networks	PC	3	0	0	3	25	75	100
4	U20CBT612	Information Security	PC	3	0	0	3	25	75	100
5	U20CBT613	Artificial Intelligence	PC	3	0	0	3	25	75	100
6	U20CBE6XX	Professional Elective II#	PE	2	2	0	3	25	75	100
Practical											
7	U20CBP610	Computer Networks Laboratory	PC	0	0	2	1	50	50	100
8	U20CBP611	Information Security Laboratory	PC	0	0	2	1	50	50	100
9	U20CBP612	Artificial Intelligence Laboratory	PC	0	0	2	1	50	50	100
10	U20CBEP6X	Professional Elective II# Laboratory	PE	0	0	2	1	50	50	100
Project Work											
11	U20CBW601	Internship/ Industrial Projects	PC	0	0	0	2	100	-	100
Employability Enhancement Course											
12	U20CBC6XX	Certification Course - VI**	EEC	0	0	4	-	100	-	100
13	U20CBS606	Skill Development Course 6: Foreign Language/ IELTS-II	EEC	0	0	2	-	100	-	100
14	U20CBS607	Skill Development Course 7: Technical Seminar	EEC	0	0	2	-	100	-	100
15	U20CBS608	Skill Development Course 8: NPTEL/MOOC-I	EEC	0	0	0	-	100	-	100
Mandatory Course											
16	U20CBM606	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							23	950	650	1600

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20HST712	Financial Management	HS	2	0	0	2	25	75	100
2	U20HST713	Human Resource Management	HS	2	0	0	2	25	75	100
3	U20CBT714	Usability Design of Software Applications	PC	2	0	0	2	25	75	100
4	U20CBT715	IT Workshop Skylab / Matlab	PC	1	2	0	2	25	75	100
5	U20CBE7XX	Professional Elective III#	PE	2	2	0	3	25	75	100
6	U20CBE7XX	Professional Elective IV#	PE	3	0	0	3	25	75	100
Practical										
7	U20CBP713	Usability Design of Software Applications Laboratory	PC	0	0	2	1	50	50	100
8	U20CBP714	IT Workshop Skylab / Matlab Laboratory	PC	0	0	2	1	50	50	100
9	U20CBEP7X	Professional Elective IV# Laboratory	PE	0	0	2	1	50	50	100
Project Work										
10	U20CBW702	Project Evaluation I	PC	0	0	4	2	100	-	100
Mandatory Course										
11	U20CBM707	Professional Ethics	MC	2	0	0	-	100	-	100
							19	500	600	1100

SEMESTER – VIII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20HST814	Services Science & Service Operational Management	HS	3	0	0	3	25	75	100
2	U20HST815	IT Project Management	HS	3	0	0	3	25	75	100
3	U20HST816	Marketing Research & Marketing Management	HS	2	0	0	2	25	75	100
4	U20CBE8XX	Professional Elective V#	PE	2	2	0	3	25	75	100
5	U20CBE8XX	Professional Elective VI#	PE	3	0	0	3	25	75	100
Practical										
6	U20HSP801	Services Science & Service Operational Management Laboratory	HS	0	0	2	1	50	50	100
7	U20HSP802	IT Project Management Laboratory	HS	0	0	2	1	50	50	100
8	U20CBEP8X	Professional Elective VI# Laboratory	PE	0	0	2	1	50	50	100
Project Work										
9	U20CBW803	Project Evaluation II	PC	0	0	16	8	40	60	100
Employability Enhancement Course										
10	U20CBS809	Skill Development Course 9: NPTEL / MOOC-II	EEC	0	0	0	-	100	-	100
							25	415	585	1000

ANNEXURE I
PROFESSIONAL ELECTIVE COURSES (18 CREDITS)

Professional Elective – I (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBE501	Conversational Systems
2	U20CBE502	Cloud, Microservices & Application
3	U20CBE503	Machine Learning
Professional Elective – II (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBE604	Robotics and Embedded Systems
2	U20CBE605	Modern Web Applications
3	U20CBE606	Data Mining and Analytics
Professional Elective – III (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBE707	Cognitive Science & Analytics
2	U20CBE708	Introduction to IoT
3	U20CBE709	Cryptology
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBE710	Quantum Computation & Quantum Information
2	U20CBE711	Advanced Social, Text and Media Analytics
3	U20CBE712	Mobile Computing
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBE813	Behavioral Economics
2	U20CBE814	Computational Finance & Modeling
3	U20CBE815	Psychology
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBE816	Enterprise Systems
2	U20CBE817	Advance Finance
3	U20CBE818	Image Processing and Pattern Recognition

PROFESSIONAL ELECTIVE PRACTICAL COURSES (4 CREDITS)

Professional Elective – I (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBEP51	Conversational Systems Laboratory
2	U20CBEP52	Cloud, Microservices & Application Laboratory
3	U20CBEP53	Machine Learning Laboratory
Professional Elective – II (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBEP61	Robotics and Embedded Systems Laboratory
2	U20CBEP62	Modern Web Applications Laboratory
3	U20CBEP63	Data Mining and Analytics Laboratory
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBEP71	Quantum Computation & Quantum Information Laboratory
2	U20CBEP72	Advanced Social, Text and Media Analytics Laboratory
3	U20CBEP73	Mobile Computing Laboratory
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CBEP81	Enterprise Systems Laboratory
2	U20CBEP82	Advance Finance Laboratory
3	U20CBEP83	Image Processing and Pattern Recognition Laboratory

ANNEXURE-II

EMPLOYABILITY ENHANCEMENT COURSES – (A). CERTIFICATION COURSES

Sl.No.	Course Code	Course Title
1	U20CBCX01	3ds Max
2	U20CBCX02	Advance Structural Analysis of Building using ETABS
3	U20CBCX03	Advanced Java Programming
4	U20CBCX04	Advanced Python Programming
5	U20CBCX05	Analog System Lab Kit
6	U20CBCX06	Android Medical App Development
7	U20CBCX07	Android Programming
8	U20CBCX08	ANSYS -Multiphysics
9	U20CBCX09	Artificial Intelligence
10	U20CBCX10	Artificial Intelligence and Edge Computing
11	U20CBCX11	Artificial Intelligence in Medicines
12	U20CBCX12	AutoCAD for Architecture
13	U20CBCX13	AutoCAD for Civil
14	U20CBCX14	AutoCAD for Electrical
15	U20CBCX15	AutoCAD for Mechanical
16	U20CBCX16	Azure DevOps
17	U20CBCX17	Basic Course on ePLAN
18	U20CBCX18	Basic Electro Pneumatics
19	U20CBCX19	Basic Hydraulics
20	U20CBCX20	Bio Signal and Image Processing Development System
21	U20CBCX21	Blockchain
22	U20CBCX22	Bridge Analysis
23	U20CBCX23	Building Analysis and Construction Management
24	U20CBCX24	Building Design and Analysis Using AECO Sim Building Designer
25	U20CBCX25	CATIA
26	U20CBCX26	CCNA (Routing and Switching)
27	U20CBCX27	CCNA (Wireless)
28	U20CBCX28	Cloud Computing
29	U20CBCX29	Computer Programming for Medical Equipments
30	U20CBCX30	Corel Draw
31	U20CBCX31	Creo (Modeling and Simulation)
32	U20CBCX32	Cyber Security
33	U20CBCX33	Data Science and Data Analytics
34	U20CBCX34	Data Science using Python
35	U20CBCX35	Data Science using R
36	U20CBCX36	Deep Learning
37	U20CBCX37	Design and Documentation using ePLAN Electric P8
38	U20CBCX38	Design of Biomedical Devices and Systems
39	U20CBCX39	Digital Marketing
40	U20CBCX40	Digital Signal Processing Development System
41	U20CBCX41	DigSILENT Power Factory
42	U20CBCX42	Electro Hydraulic Automation with PLC
43	U20CBCX43	Embedded System using Arduino
44	U20CBCX44	Embedded System using C
45	U20CBCX45	Embedded System with IoT
46	U20CBCX46	ePLAN Data Portal
47	U20CBCX47	ePLAN Electric P8
48	U20CBCX48	ePLAN Fluid
49	U20CBCX49	ePLAN PPE
50	U20CBCX50	Fusion 360
51	U20CBCX51	Fuzzy Logic and Neural Networks

52	U20CBCX52	Google Analytics
53	U20CBCX53	Hydraulic Automation
54	U20CBCX54	Industrial Automation
55	U20CBCX55	Industry 4.0
56	U20CBCX56	Internet of Things
57	U20CBCX57	Introduction to C Programming
58	U20CBCX58	Introduction to C++ Programming
59	U20CBCX59	IoT using Python
60	U20CBCX60	Java Programming
61	U20CBCX61	Machine Learning
62	U20CBCX62	Machine Learning and Deep Learning
63	U20CBCX63	Machine Learning for Medical Diagnosis
64	U20CBCX64	Mechatronics
65	U20CBCX65	Medical Robotics
66	U20CBCX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
67	U20CBCX67	Mobile Edge Computing
68	U20CBCX68	Modeling and Visualization using Micro station
69	U20CBCX69	MX Road
70	U20CBCX70	Photoshop
71	U20CBCX71	PLC
72	U20CBCX72	Pneumatics Automation
73	U20CBCX73	Project Management
74	U20CBCX74	Python Programming
75	U20CBCX75	Revit Architecture
76	U20CBCX76	Revit Inventor
77	U20CBCX77	Revit MEP
78	U20CBCX78	Robotics
79	U20CBCX79	Search Engine Optimization
80	U20CBCX80	Software Testing
81	U20CBCX81	Solar and Smart Energy System with IoT
82	U20CBCX82	Solid Works
83	U20CBCX83	Solid Works with Electrical Schematics
84	U20CBCX84	Speech Processing
85	U20CBCX85	STAAD PRO V8i
86	U20CBCX86	Structural Design and Analysis using Bentley
87	U20CBCX87	Total Station
88	U20CBCX88	Video and Image Processing Development System
89	U20CBCX89	VLSI Design
90	U20CBCX90	Web Programming - I
91	U20CBCX91	Web Programming - II

ANNEXURE-III

EMPLOYABILITY ENHANCEMENT COURSES-(B) SKILL DEVELOPMENT COURSES

Sl. No.	Course Code	Course Title
1.	U20CBS201	Skill Development Course 1 :Demonstration of Workshop Practices
2.	U20CBS302	Skill Development Course 2 *
		1) Hardware and Troubleshooting
		2) Graphics Design
		3) Industrial Management
3.	U20CBS403	Skill Development Course 3 *
		1) Ecommerce and E payment Systems
		2) Business Intelligence
		3) Communication Engineering
4.	U20CBS504	Skill Development Course 4 : Foreign Language/ IELTS -I
5.	U20CBS505	Skill Development Course 5 : Presentation Skills using ICT
6.	U20CBS606	Skill Development Course 6 : Foreign Language/ IELTS - II
7.	U20CBS607	Skill Development Course 7 : Technical Seminar
8.	U20CBS608	Skill Development Course 8 : NPTEL / MOOC - I
9.	U20CBS809	Skill Development Course 9 : NPTEL / MOOC-II

** Choose any one skill development course in the list for SDC 2 and SDC 3*

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20HST101	Business Communication & Value Science - I	HS	1	0	2	2	25	75	100
2	U20BST102	Discrete Mathematics	BS	2	2	0	3	25	75	100
3	U20BST103	Introductory Topics in Statistics and Probability	BS	3	0	0	3	25	75	100
4	U20BST113	Physics for Computing Science	BS	3	0	0	3	25	75	100
5	U20EST134	Fundamentals of Computer Science	ES	3	0	0	3	25	75	100
6	U20EST136	Principles of Electrical Engineering	ES	2	0	0	2	25	75	100
Practical										
7	U20BSP114	Physics for Computing Science Laboratory	BS	0	0	2	1	50	50	100
8	U20ESP135	Fundamentals of Computer Science Laboratory	ES	0	0	2	1	50	50	100
9	U20ESP137	Principles of Electrical Engineering Laboratory	ES	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CBC1XX	Certification Course-I **	EEC	0	0	4	-	100	-	100
Mandatory Course										
11	U20CBM101	Induction Program	MC	3Weeks			-	-	-	-
							19	400	600	1000

SEMESTER – II											
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory											
1	U20HST202	Business Communication & Value Science – II	HS	2	0	0	2	25	75	100
2	U20HST203	Fundamentals of Economics	HS	2	0	0	2	25	75	100
3	U20BST216	Linear Algebra	BS	3	2	0	4	25	75	100
4	U20BST217	Statistical Methods	BS	3	0	0	3	25	75	100
5	U20EST251	Principles of Electronics	ES	2	0	0	2	25	75	100
6	U20CBT201	Data Structures & Algorithms	PC	2	2	0	3	25	75	100
Practical											
7	U20BSP218	Statistical Methods Laboratory	BS	0	0	2	1	50	50	100
8	U20ESP252	Principles of Electronics Laboratory	ES	0	0	2	1	50	50	100
9	U20CBP201	Data Structures & Algorithms Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course											
10	U20CBC2XX	Certification Course - II**	EEC	0	0	4	-	100	-	100
11	U20CBS201	Skill Development Course 1 - Demonstration of Workshop Practices	EEC	0	0	2	-	100	-	100
Mandatory Course											
12	U20CBM202	Environmental Sciences	MC	2	0	0	-	100	-	100
							19	600	600	1200

U20HST101	BUSINESS COMMUNICATION & VALUE SCIENCE - I	L	T	P	C	H
		1	0	2	2	45

Course Objectives

- To understand what life skills are and their importance in leading a happy and well-adjusted life
- To develop the basic grammar skills
- To motivate students to look within and create a better version of self
- To introduce them to key concepts of values, life skills and business communication
- To comprehend the varied features of communication

Course Outcomes

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

CO1 - Recognize the need for life skills and values **(K1)**
CO2 - Apply the knowledge of grammar in oral and written communication **(K3)**
CO3 - Recognize own strengths and opportunities **(K1)**
CO4 - Understand the basic tenets of communication **(K2)**
CO5 - Apply the basic communication practices in different types of communication **(K3)**

UNIT – I PEOPLE SKILLS AND SELF-INTROSPECTION **(9 Hrs)**

Presentation on favourite cricket captain and the skills and values they demonstrate- Interviewing a maid, watchman, sweeper, cab driver, and beggar and narrate the values that drive them- Overviewing business communication- Writing Newspaper Report on football, hockey match, accident report or current political scenario- Record conversation between a celebrity and an interviewer- - Self-awareness – identity, body awareness, stress management.

UNIT – II GRAMMAR **(9 Hrs)**

Essential Grammar: Parts of Speech - Tenses: Applications of tenses on Functional Grammar, Sentence formation : (General and Technical) - Common Errors-Voices -Sentence Sequence

UNIT – III FUNDAMENTALS IN COMMUNICATION **(9 Hrs)**

Types of communication: Verbal and Non – verbal – Role-play -Importance of Questioning, Listening Skills: Importance, Difference between listening and hearing, Types of listening - Expressing self – connecting with emotions, visualization and experience, Skit based on communication skills- Evaluation on Listening skills: listens to recording and answer questions based on them.

UNIT – IV ORGANISATIONAL COMMUNICATION **(9 Hrs)**

Email writing: Formal and informal -Verbal communication: Pronunciation, clarity and brevity of speech - Vocabulary Enrichment: General Service List (GSL), Academic word list (AWL) technical terms, phrases, idioms, significant abbreviations, formal business vocabulary - Reading activity: Reading Newspapers, Magazine , Journal etc. and take part in GD, Practice: Table Topics speech - Written Communication: Narrative writing – creating CV –Life skill: Stress management and teamwork - Project: Create a podcast on a topic

UNIT – V INCORPORATING LIFE SKILLS WITH VALUES **(9 Hrs)**

Life Skills: Movie based learning – identifying skills and values - Critical life skills - Multiple Intelligences - Work with an NGO and makes a presentation – Values: Leadership, Teamwork, Managing Stress, Motivation, and Creativity

Reference Books

1. English vocabulary in use – Alan Mc'carthy and O'dell
2. APAART: Speak Well 1 (English language and communication)
3. APAART: Speak Well 2 (Soft Skills)
4. Business Communication – Dr. Saroj Hiremath
5. Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

Web References

1. Train your mind to perform under pressure- Simon sinek
2. https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/
3. Brilliant way one CEO rallied his team in the middle of layoffs
4. https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html
5. Will Smith's Top Ten rules for success
6. https://www.youtube.com/watch?v=bBsT9omTeh0
7. https://www.coursera.org/learn/learning-how-to-learn
8. https://www.coursera.org/specializations/effective-business-communication

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

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

U20BST102	DISCRETE MATHEMATICS	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To understand the concepts and significance of Boolean algebra.
- To know the fundamental concepts of Group theory.
- To understand the basic concepts of combinatorics and graph theory.
- To learn the basic of graph theory.
- To extend student's ability to deal with logics and connectives.

Course Outcomes

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

CO1 - Understand the basic concepts of Boolean algebra. **(K2)**
CO2 - Recall the basic concepts of sets, groups, ring and field. **(K2)**
CO3 - Understand and apply the basic concepts of mathematical induction. **(K3)**
CO4 - Determine the different types of graphs. **(K3)**
CO5 - Gain knowledge of the concepts needed to test the logic of a program. **(K2)**

UNITI BOOLEAN ALGEBRA **(12 Hrs)**

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

UNIT II ABSTRACT ALGEBRA **(12 Hrs)**

Set: Definition, simple problems, Relation: types, simple problems, Group: monoid, semigroup, group, Abelian group, simple problems Ring: Definition, simple problems Field: Definition, simple problems.

UNIT III COMBINATORICS **(12 Hrs)**

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

UNIT IV GRAPH THEORY **(12 Hrs)**

Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.

UNIT V LOGIC **(12 Hrs)**

Propositional calculus - propositions and connectives, syntax; Semantics – truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness.

Text Books

1. I. N. Herstein, John Wiley and Sons, "Topics in Algebra".
2. M. Morris Mano," Digital Logic & Computer Design", Pearson.
3. C. L. LiuMcGraw Hill, "Elements of Discrete Mathematics", (Second Edition) New Delhi.
4. J. A. Bondy and U. S. R. Murty, "Graph Theory with Applications", Macmillan Press, London.
5. L. Zhongwan, "Mathematical Logic for Computer Science", World Scientific, Singapore.

Reference Books

1. Gilbert Strang, "Introduction to linear algebra".
2. R. A. Brualdi, "Introductory Combinatorics", North-Holland, New York.
3. N. Deo, Prentice Hall, Englewood Cliffs, "Graph Theory with Applications to Engineering and Computer Science".
4. E. Mendelsohn, Van-Nostrand, "Introduction to Mathematical Logic", (Second Edition), London.

Web References

1. https://youtu.be/0Dx7r0PFyUM
2. https://youtu.be/rs5S0Ehp3s8
3. https://youtu.be/aUjq6o0PmjY
4. https://youtu.be/fZqfkJ-cb28
5. https://youtu.be/oaOm2pnKkyY

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

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

U20BST103	INTRODUCTORY TOPICS IN STATISTICS AND PROBABILITY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn the concepts of evaluation using statistical analysis
- To Know the central tendency like mean, median, mode etc.
- To study the basic probability concepts
- To introduce knowledge of standard discrete distributions.
- To acquire knowledge on probability continuous distributions

Course Outcomes

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

CO1 - Understand the types of data and graphical representation in statistics. **(K2)**
CO2 - Apply the concepts of central tendency. **(K2)**
CO3 - Recall the concepts of basic probability. **(K2)**
CO4 - Apply the basic rules of discrete random variables. **(K3)**
CO5 - Apply the fundamentals of probability theory and random processes. **(K3)**

UNIT I INTRODUCTION TO STATISTICS **(9 Hrs)**

Definition of Statistics. Basic objectives. Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample.

UNIT II DESCRIPTIVE STATISTICS **(9 Hrs)**

Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution.

UNIT III BASICS OF PROBABILITY **(9 hrs)**

Concept of experiments, sample space, event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem.

UNIT IV DISCRETE PROBABILITY DISTRIBUTIONS **(9 hrs)**

Discrete Distributions: Probability mass function – Probability density function- Distribution functions, Binomial, Geometric, Negative Binomial, Poisson.

UNIT V CONTINUOUS PROBABILITY DISTRIBUTIONS **(9 hrs)**

Continuous Distributions: Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties – Functions of a random variable.

Text Books

1. S.M. Ross, "Introduction of Probability Models", Academic Press, N.Y.
2. A. Goon, M. Gupta and B. Dasgupta, "Fundamentals of Statistics", vol. I & II, World Press.
3. Bali N.P. and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2015
4. T. Veerarajan," Probability and Statistics, Random Process and Queuing Theory", McGraw Hill Education, 2018.
5. **P. Sivaramakrishna Das, C. Vijayakumari**, "Probability and Queuing Theory", Pearson Education, 6th Edition, 2019.
6. G. Balaji, "Probability and Queuing Theory", Balaji Publication, Revised Edition 2017.

Reference Books

1. S.M. Ross, "A first course in Probability", Prentice Hall.
2. I.R. Miller, J.E. Freund and R., "Johnson, Probability and Statistics for Engineers",(Fourth Edition), PHI.
3. A.M. Mood, F.A. Graybilland D.C. Boes, "Introduction to the Theory of Statistics", McGraw Hill Education.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2019.
5. Ravish R. Singh and Mukul Bhatt, "Engineering Mathematics", Tata McGraw Hill, 1st Edition, New Delhi, 2016.
6. Ramana B.V.," Higher Engineering Mathematics", Tata Mc Graw Hill, New Delhi 2018.

Web References

1. https://youtu.be/BceFKnWh68Y
2. https://youtu.be/fjDh4WPTGq4
3. https://youtu.be/Hw8KHNgRaOE
4. https://youtu.be/2CP3m3EgL1Q
5. https://youtu.be/wo__Vag3yls
6. https://swayam.gov.in/nd1_noc20_ma17/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	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
3	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
4	3	2	1	1	-	-	-	-	-	-	-	-	2	1	-
5	3	2	1	1	-	-	-	-	-	-	-	-	2	1	1

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

		L	T	P	C	H
U20BST113	PHYSICS FOR COMPUTING SCIENCE	3	0	0	3	45

Course Objectives

- To understand the fundamental concept of oscillations.
- To understand the concepts of optical devices, Lasers and Fiber optics.
- To learn about the basic fundamentals of Interference and Polarization of light.
- To study the fundamental concepts of electromagnetism, crystallography
- To learn about the basic fundamentals of quantum mechanics and Thermodynamics

Course Outcomes

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

CO1 - Explain the concepts of simple harmonic oscillations **(K1)**

CO2 - Describe the basic concepts of Interference, diffraction and polarization **(K2)**

CO3 - Analyse the concept of laser and types of laser and fibre optics **(K1)**

CO4 - Understand the basic concept of crystal system, Bravais lattice, crystal structure, band theory of solids. **(K2)**

CO5 - Demonstrate concepts of quantum mechanics and thermodynamics. **(K1)**

UNIT I OSCILLATION **(9 Hrs)**

Oscillation: Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring mass system. Resonance-definition., damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators

UNIT II INTERFERENCE AND POLARIZATION OF LIGHT **(9 Hrs)**

Interference-principle of superposition-young's experiment: Theory of interference fringes-types of interference-Fresnel's prism-Newton's rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel's half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence.

Polarization of light: Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster's law, double refraction..

UNIT III LASER AND FIBER OPTICS **(9 Hrs)**

Laser and Fiber optics: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO2 and Neodymium lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and Applications, Types of optical fibers.

UNIT IV CRYSTALLOGRAPHY, ELECTROMAGNETISMS AND SEMICONDUCTOR PHYSICS **(9 Hrs)**

Crystallography: Basic terms-types of crystal systems, Bravais lattices, miller indices, d spacing, Atomic packing factor for SC, BCC, FCC and HCP structures.

Basic Idea of Electromagnetisms: Continuity equation for current densities, Maxwell's equation in vacuum and non-conducting medium.

Semiconductor Physics: Conductor, Semiconductor and Insulator; Basic concept of Band theory.

UNIT -V QUANTUM MECHANICS AND THERMODYNAMICS (9 Hrs)

Quantum Mechanics: Introduction - Planck's quantum theory- Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one dimensional potential box, Heisenberg Picture.

Thermodynamics: Zeroth law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Engine, entropy, change in entropy in reversible and irreversible processes.

Text Books

1. A Beiser ,"Concepts of Modern Physics",seventh Edition, McGraw Hill International, 2015.
2. David Halliday, Robert Resnick and Jearl Walker ,"Fundamentals of Physics", Tenth Edition, Wileyplus ,2015

Reference Books

1. Ajoy Ghatak," Optics", Fifth Edition, Tata McGraw Hill, 2012.
2. Sears & Zemansky," University Physics", Tenth Edition, Addison-Wesley, 1999.
3. Jenkins and White ,"Fundamentals of Optics", Fourth Edition, McGraw-Hill, 2011.

Web References

1. https://nptel.ac.in/courses/122/105/122105023/
2. https://nptel.ac.in/courses/115/105/115105099/

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

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

U20EST134	FUNDAMENTALS OF COMPUTER SCIENCE	L	T	P	C	H
		3	0	0	3	45

Course Objectives

- To understand the basic concepts of problem solving concepts.
- To gain Knowledge about the syntax and semantics about programming language.
- To learn the techniques of Pointers, Arrays and Functions in C.
- To be exposed to user defined data types to handle the files.
- To develop program using pre-processor directives and files.

Course Outcomes

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

CO1 - Recognize the basics of programming concepts **(K1)**
CO2 - Choose appropriate controls and functions to solve the problems **(K1)**
CO3 - Develop and Manage memory with Pointers and Arrays. **(K3)**
CO4 - Explore the various Input and Output functions. **(K2)**
CO5 - Create and Manipulate the Files accessing and storage. **(K3)**

UNIT I INTRODUCTION **(9 Hrs)**

Algorithm and Flowchart for problem solving with Sequential Logic Structure- Decisions and Loops. Introduction to imperative language; syntax and constructs of a specific language (ANSI C)- Variable Names-Data Type and Sizes (Little Endian Big Endian)- Constants- Declarations- Arithmetic Operators- Relational Operators-Logical Operators-Type Conversion- Increment Decrement Operator-Bitwise Operators- Assignment Operators and Expressions- Precedence and Order of Evaluation-proper variable naming and Hungarian Notation

UNIT II CONTROL FLOW AND FUNCTIONS **(9 Hrs)**

Statements and Blocks- If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and un- structured programming. Basics of functions- parameter passing and returning type- C main return as integer,-External- Auto- Local- Static- Register Variables- Scope Rules- Block structure- Initialization- Recursion- Pre-processor- Standard Library Functions and return types.

UNIT III POINTERS, ARRAYS AND STRUCTURES **(9 Hrs)**

Pointers and address- Pointers and Function Arguments- Pointers and Arrays- Address Arithmetic-character Pointers and Functions- Pointer Arrays- Pointer to Pointer- Multi-dimensional array and Row/column major formats- Initialization of Pointer Arrays- Command line arguments- Pointer to functions- complicated declarations and how they are evaluated. Basic Structures- Structures and Functions- Array of structures- Pointer of structures- Self-referral structures- Table look up-typedef,-unions- Bit-fields

UNIT IV INPUT AND OUTPUT **(9 Hrs)**

Standard I/O, Formatted Output – printf, Formated Input – scanf- Variable length argument list- file access including FILE structure- fopen, stdin, sdtout and stderr,-Error Handling including exit- perror and error.h- Line I/O- related miscellaneous functions.

UNIT -V UNIX SYSTEM INTERFACE **(9 Hrs)**

File Descriptor- Low level I/O – read and write- open,-create- close and unlink- Random access – lseek- Discussions on Listing Directory- Storage allocator.
Programming Method: Debugging, Macro, User Defined Header, User Defined Library Function, makefile utility.

Text Books

1. The C Programming Language, (Second Edition) B. W. Kernighan and D. M. Ritchi, PHI.
2. Programming in C, (Second Edition) B. Gottfried, Schaum Outline Series.
3. Programming in ANSI C, Forth Edition, E Balagurusamy, TMH

Reference Books

1. C: The Complete Reference, (Fourth Edition), Herbert Schildt, McGraw Hill.
2. Let Us C, Yashavant Kanetkar, BPB Publications
3. Computer fundamentals and Programming in C, Pradip dey and Manas Ghosh,Oxford

Web References

1. https://codeforwin.org/
2. https://www.geeksforgeeks.org/c-programming-language/
3. http://learn-c.org/
4. https://www.cprogramming.com/
5. https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial/index.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	-	-
2	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	3	1	-
4	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	1	-

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

U20CBT136	PRINCIPLES OF ELECTRICAL ENGINEERING	L	T	P	C	Hrs
		2	0	0	2	45

Course Objectives

- To explain the basic definitions and laws used to solve the DC and AC circuits.
- Make the students to become familiar in applying circuit theorems for electrical circuits.
- To understand the construction and working principle of electrical machines.
- To impart knowledge on sensors and electrical wirings.
- To introduce the concept of electrical safety and power system.

Course Outcomes

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

CO1 - Analyse the various laws and theorems used in DC circuits. **(K4)**

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

CO3 - Explain the concepts of Electrostatics and Electro-Mechanics. **(K2)**

CO4 - Demonstrate the operation of transformers, DC/AC rotating machines and their performance characteristics. **(K2)**

CO5 - Develop the various wiring diagrams for house and to study the characteristics of sensors. **(K3)**

UNIT-I DC CIRCUITS **(9 Hrs)**

Concept of Potential difference, voltage, current, work, Power, Energy, Conversion of Energy - Electric networks, voltage source and current sources, linear passive and active elements, current-voltage relation, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Simplifications of networks using series-parallel, Star/Delta transformation. Theorem – Superposition, Thevenin's, Norton's and Maximum Power Transfer.

UNIT-II AC CIRCUITS **(9 Hrs)**

AC waveform- definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, R-L-C parallel circuit, phasor representation, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, Resonance in series and parallel circuits, bandwidth and quality factors,3 phase Balanced AC Circuits (Y-Δ and Y-Y).

UNIT-III ELECTROSTATICS AND ELECTRO-MECHANICS **(9 Hrs)**

Coulomb's law, Electrostatic field, electric field strength, permittivity in dielectrics, Electric potential, capacitor composite, dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors, Principle of batteries, types, construction and application. Electricity and Magnetism, magnetic field and Faraday's law, self and mutual inductance, Ampere's law, Magnetic Circuits, Magnetic material and B-H Curve.

UNIT IV TRANSFORMER AND ROTATING MACHINES **(9 Hrs)**

Single Phase transformer-principle of operation – EMF equation – voltage ratio and current ratio – KVA rating – efficiency and regulation – Autotransformer – Electromechanical energy conversion – Flemings right and left hand rule – principle, construction and working of DC generator and DC motor - single phase/three phase induction motor , Alternator and synchronous motor (Qualitative approach only)

UNIT-V MEASUREMENTS AND SENSORS (9 Hrs)

Block diagram of measurement system, Introduction to measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, construction and working principle of PMMC and MI type instruments, single phase dynamometer type wattmeter and induction type energy meter-introduction to display devices. Electrical Wiring and Illumination system: One line diagram of power system - Components of AC transmission and distribution systems, Types of Wiring System &Wiring Accessories, Necessity of earthing, Types of earthing, Safety devices and system. Principle of electrical heating –laws of illumination – Electric lamps – Electroplating.

Text Books

1. A.E.Fitzgerald, Charles Kingsley, Stephen. D. Umans, "Electric Machinery", Tata Mcgraw Hill, New Delhi, 7th Edition, 2013.
2. Theraja B. L and Theraja A. K., "A Textbook of Electrical Technology", Vol. II, S Chand & Co. Ltd., New Delhi, 2009
3. D.P.Kothari and I.J. Nagrath, "Electric Machines", Tata McGraw Hill, New Delhi, 5th Edition, 2017.
4. Sudhakar.A and Shyam Mohan.S.P, "Circuits and Networks Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th edition, 2010.
5. A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, "Basic Electrical Engineering", McGraw Hill Education (India) Private Limited, 2009.

Reference Books

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
3. William H Hayt, J E Kemmerly and Steven M Durbin, "Engineering Circuit Analysis", McGraw Hill, 7th Edition, 2007.
4. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.
5. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
6. Stephen L. Herman, " Electrical Wiring", 2008
7. Allan S Moris, "Measurement and Instrumentation Principles", Elseveir, First Indian Edition, 2006
8. R.K.Rajput, " Utilization of electrical power", First edition, Lakshmi publications, 2006

Web References

1. https://www.electronics-tutorials.ws/
2. https://nptel.ac.in/courses/108/108/108108076/
3. https://www.gopracticals.com/basic-engineering/electrical/
4. https://link.springer.com/book/10.1007/978-3-319-21173-2
5. https://www.electrical4u.com/

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

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

U20BSP114	PHYSICS FOR COMPUTING SCIENCE LABORATORY	L	T	P	C	H
		0	0	2	1	30

Course Objectives

- To learn the fundamental Practical Knowledge in light, heat and Hall effect
- To study the fundamental concepts of interference, diffraction and crystallography
- To learn the basic fundamentals Practical Knowledge laser and optical fibre
- To provide a practical understanding of some of the concepts learnt in the theory course on Physics.
- Evaluate the process and outcomes of an experiment quantitatively and qualitatively.

Course Outcomes

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

CO1 - Determine the horizontal components of earth magnetic field **(K1)**
CO2 - Analyze the basic properties of semiconductors via Hall Effect. **(K2)**
CO3 - Demonstrate the use of Plank constant and stefan's constant **(K3)**
CO4 - Demonstrate wavelength of light and laser by diffraction and interference method **(K2)**
CO5 - Analyse the basic properties of Laser and optical fiber parameters **(K1)**

LIST OF EXPERIMENTS

1. Magnetic field along the axis of current carrying coil – Stewart and Gee
2. Determination of Hall coefficient of semi-conductor
3. Determination of Plank constant
4. Determination of wave length of light by Laser diffraction method
5. Determination of wave length of light by Newton's Ring method
6. Determination of laser and optical fiber parameters
7. Determination of Stefan's Constant.

Reference Books

1. Experiments in Modern Physics 2nd Edition, Kindle Edition- Adrian C. Melissinos , Jim Napolitano
2. Engineering Practical Physics 1st Edition, Cengage Learning -B Mallick S Panigrahi
3. B.Sc. Practical Physics, S.Chand –2000 - Singh Harnam , Hemne P.S.

Web References

1. https://lo-au.vlabs.ac.in/
2. https://hmw-au.vlabs.ac.in/

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

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

U20ESP135	FUNDAMENTALS OF COMPUTER SCIENCE LAB	L	T	P	C	H
		0	0	2	1	30

Course Objectives

- To understand the basic concepts of problem solving concepts.
- To gain Knowledge about the syntax and semantics about programming language.
- To learn the techniques of Pointers, Arrays and Functions in C.
- To be exposed to user defined data types to handle the files.
- To develop program using pre-processor directives and files.

Course Outcomes

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

CO1 - Develop Algorithm and Flowcharts **(K3)**
CO2 - Develop program using tricky codes and parameter passing **(K3)**
CO3 - Analyse problems and implement those using functions **(K3)**
CO4 - Design applications using Files concepts **(K3)**
CO5 - Analyse and discover searching programs **(K3)**

LIST OF EXPERIMENTS

1. Algorithm and flowcharts of small problems like GCD
2. Develop a Small but tricky codes
3. Develop a program with Proper parameter passing
4. Write a C program using Command line Arguments
5. Write a Program to understand about Variable parameter
6. Develop a program to illustrate the use of Pointer to functions
7. Write a program to explain the concept of User defined header
8. Write a program to analyze the importance of Make file utility
9. Develop a program to elucidate Multi file program and user defined libraries
10. Develop a program with Interesting substring matching / searching programs
11. Write programs with Parsing related assignments

Text Books

1. The C Programming Language, (Second Edition) B. W. Kernighan and D. M. Ritchi, PHI.
2. Programming in C, (Second Edition) B. Gottfried, Schaum Outline Series.
3. Programming in ANSI C, Forth Edition, E Balagurusamy, TMH

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1. C: The Complete Reference, (Fourth Edition), Herbert Schildt, McGraw Hill.
2. Let Us C, Yashavant Kanetkar, BPB Publications
3. Computer fundamentals and Programming in C, Pradip dey and Manas Ghosh,Oxford

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1. https://codeforwin.org/
2. https://www.geeksforgeeks.org/c-programming-language/
3. http://learn-c.org/
4. https://www.cprogramming.com/
5. http://cse02-iiith.vlabs.ac.in/

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

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

U20ESP137	PRINCIPLES OF ELECTRICAL ENGINEERING LAB	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To introduce practical knowledge on domestic wiring and analysis of electrical circuits.
- To gain practical experience to analyze series and parallel resonance circuits
- To understand the steady state and transient behaviour of networks
- To simulate various electric circuit using simulation software.
- To provide the methods to test and evaluate the performance of electrical machines.

Course Outcomes

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

CO1 - Prepare line diagram and understand the domestic and industrial wiring **(K5)**
CO2 - Analyze series and parallel resonance circuits **(K4)**
CO3 - Analyse the steady state and transient behaviour of networks **(K4)**
CO4 - Evaluate various electric circuits and validate the results through simulation. **(K5)**
CO5 - Analyze the performance of DC and induction motor **(K4)**

LIST OF EXPERIMENTS

1. Domestic Wiring Practice
   a. Staircase wiring
   b. Doctor's room wiring
   c. Godown wiring
   d. Ceiling fan and fluorescent lamp wiring
2. Verification of Network Theorems - Superposition, Thevenin's, Norton's and Maximum Power Transfer.(simulation and experimental)
3. Determination of resistance temperature coefficient
4. Determination of Characteristics of LDR
5. Simulation of R-L-C Series Circuit for $X_L > X_C$, $X_L < X_C$
6. Simulation of Time response of RC circuit
7. Load test on single phase transformer.
8. Measurement of 3-phase power using two wattmeter methods.
9. Load test on DC shunt motor.
10. Load test on single phase induction motor.
11. Load test on three phase induction motor.
12. Calibration of single phase phase Energy meter using loading method.

Reference Books

1. Sudhakar.A and Shyam Mohan.S.P, "Circuits and Networks Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4 th edition, 2010.
2. A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, "Basic Electrical Engineering", McGraw Hill Education (India) Private Limited, 2009.
3. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
4. Smarjith Ghosh ,"Fundamentals of Electrical and Electronics Engineering" , Prentice Hall Pvt. Ltd, Second Edition, 2007.

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1. https://www.electronics-tutorials.ws/
2. https://nptel.ac.in/courses/108/108/108108076/
3. https://www.gopracticals.com/basic-engineering/electrical/
4. https://link.springer.com/book/10.1007/978-3-319-21173-2
5. https://www.electrical4u.com/

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

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

U20HST202	BUSINESS COMMUNICATION & VALUE SCIENCE - II	L	T	P	C	H
		2	0	0	2	45

Course Objectives

- To develop effective writing, reading, presentation and group discussion skills.
- To identify personality traits and evolve as a better team player.
- To Introduce them to key concepts of Morality and Behaviour and beliefs ,diversity and inclusion
- Understand the concept of speed reading
- Identify the individual personality types

Course Outcomes

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

CO1 - Understand tools of structured written communication **(K2)**
CO2 - Understand the basics of presentation **(K2)**
CO3 - Apply the basic concept of speed reading, skimming and scanning **(K3)**
CO4 - Identify individual personality types and role in a team **(K3)**
CO5 - Recognize the concepts of outward and internal behaviour **(K1)**

UNIT – I SOCIETAL NEEDS AND EXPERTISE WRITING **(9 Hrs)**

Participate in 'Join Hands Movement'- Individual identification of social issues - Theory to introduce the participant - Research on the social cause - Class discussion - Good and Bad Writing - Common errors, punctuation rules, and use of words.

Practical: Plan and design an E Magazine. Refer Catherine Morris and Joanie McMahon's writing techniques - Create the magazine

SATORI – Participants share the personal take away acquired from GD, writing and reading skills activities captured in their handbook. Share the most important learning points from the activities done so far and how that learning has brought a change. Launching an E Magazine, Quiz Time

UNIT – II INNOVATIVE DESIGNING SKILLS **(9 Hrs)**

Each group will form an NGO. Create Vision, Mission, Value statement, tagline and Design a logo. Introduction to basic presentation skills & ORAI app. Prepare and publish the Second episode of the E Magazine. Skimming and Scanning.

SATORI –Participants to connect their learning gathered from AIP Unit-2 with their existing curriculum, Quiz Time

UNIT – III INTERPERSONAL SKILLS **(9 Hrs)**

Ad campaign- Brain storming, Design a skit, Enact the play, Intro of Dr. Meredith Belbin and his research on team work, Belbin's 8 Team Roles and Lindgren's Big 5 personality traits. Team Falcon Practical to identify individual personality traits with Belbin's 8 team player styles, Prepare and publish the third episode of the E Magazine.

SATORI –Participants share the personal take away acquired from working in teams, GD, learning about presentations, presenting their NGOs, Quiz Time

UNIT – IV FILM MAKING AND REVIEWING **(9 Hrs)**

A short film on diversity - Discuss key take away of the film. Touch the target (Blind man) - Debriefing of the Practical.- Film: "The fish and I" by Babak Habibifar" (1.37mins)

Groups to create a story – 10 minutes of a person's life affected by the social issue groups are working on, Feedback - Research on a book, incident or film based on the topic of your respective NGO - Write a review in a blog on the topics they are covering in their research.

UNIT – V DIVERSIFIED COMMUNICATION SKILLS **(9 Hrs)**

Diversity & Inclusion - Different forms of Diversity in society - Teams to video record interviews of people from diverse groups. Share the recordings in FB - Debate - Discussion on TCS values - Prepare and publish the final episode of the E Magazine.

SATORI –Participants share the personal take away acquired from working in teams, GD, learning about presentations and understanding diversity inclusion. Quiz Time

Project

1. Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting.
2. Spend **a day with the NGO/ social group** to understand exactly how they work and the challenges they face.
3. Render voluntary service to the group for one day
4. Invite the NGO/ social group to address their university students for couple of hours. Plan the entire event, decide a suitable venue in the university, gather audience, invite faculty members etc. (they need to get their plan ratified their professor). Outcome-- Host an interactive session with the NGO spokesperson
5. The groups to present their experience of **a day with the NGO** and inspire students to work for the cause.

Reference Books

1. Guiding Souls : Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam ;Publishing Year-2005; Co-author--Arun Tiwari
2. The Family and the Nation; Dr. A.P.J Abdul Kalam; Publishing year: 2015; Co-author: Acharya Mahapragya
3. The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.J Abdul Kalam; Publishing year: 2011; Co-author- Y.S.Rajan
4. Forge Your Future: Candid, Forthright, Inspiring ; Dr. A.P.J Abdul Kalam; Publishing year: 2014
5. Abundance: The Future is Better Than You Think; Peter H. Diamandis and Steven Kotler; Published: 21 Feb, 2012; Publisher: Free Press
6. Start With Why: How Great Leaders Inspire Everyone to Take Action; Simon Sinek; Published: 6 October 2011; Publisher: Penguin
7. Advertising & IMC: Principles and Practice; Sandra Moriarty, Nancy D. Mitchell, William D. Wells; Published: 15 June 2016; Publisher: Pearson Education India

Web References

1. Ethics Fundamentals And Approaches To Ethics Https://Www.Eolss.Net/Sample-Chapters/C14/E1-37-01-00.Pdf
2. A Framework for Making Ethical Decisions
3. https://www.brown.edu/academics/science-and-technology-studies/framework-making-ethical-decisions
4. Five Basic Approaches to Ethical Decision-http://faculty.winthrop.edu/meelerd/docs/rolos/5_Ethical_Approaches.pdf
5. https://youtu.be/CsaTslhSDI
6. https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
7. https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
8. https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
9. https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

COs/POs/PSOs Mapping

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

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

U20HST203 FUNDAMENTALS OF ECONOMICS

L	T	P	C	H
2	0	0	2	45

Course Objectives

- To develop an understanding of the framework that economists use to analyse choices made by individuals in response to incentives and consider how these choices can also serve the social interest.
- To Measure how changes in price and income affect the behaviour of buyers and sellers
- To analyze how buyers and sellers interact in a free and competitive market to determine prices and quantities of goods
- To evaluate macro-economic performance using indicators that include output measures and unemployment
- To understand the strengths and weakness of fiscal and monetary policy to determine an appropriate stabilization policy for a given macroeconomic situation

Course Outcomes

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

CO1 – Infer how competitive markets organise the allocation of scarce resources and the distribution of goods and services. **(K1)**

CO2 – Relate the basic economic theory and principles to current microeconomic issues and evaluate related public policy. **(K1)**

CO3 – Analyse the various types of markets and compare their efficiency. **(K1)**

CO4 – Determine the major economic indicators used to assess the state of the macro economy. **(K1)**

CO5 – chooses an appropriate fiscal and monetary policy for a given state of the economy. **(K1)**

UNIT I DEMAND AND SUPPLY **(9 Hrs)**

Principles of Demand and Supply- Supply Curves of Firms - Elasticity of Supply; Demand Curves of Households- Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve).

UNIT II WELFARE ANALYSIS AND CONSUMER BEHAVIOUR **(9 Hrs)**

Consumers' and Producers' Surplus - Price Ceilings and Price Floors; Consumer Behaviour- Axioms of Choice - Budget Constraints and Indifference Curves; Consumer's Equilibrium- Effects of a Price Change, Income and Substitution Effects -Derivation of a Demand Curve; Applications- Tax and Subsidies -Intertemporal Consumption - Suppliers' Income Effect.

UNIT III PRODUCTION CONCEPT AND COST CONCEPT **(9 Hrs)**

Theory of Production - Production Function and Iso-quants - Cost Minimization; Cost Curves- Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition.

UNIT IV MACROECONOMIC MEASURES OF PERFORMANCE **(9 Hrs)**

National Income and its Components- GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector- Taxes and Subsidies; External Sector- Exports and Imports.

UNIT V STABILIZATION POLICY **(9 Hrs)**

Money- Definitions; Demand for Money-Transactionary and Speculative Demand; Supply of Money- Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets- IS, LM Model; Business Cycles and Stabilization- Monetary and Fiscal Policy - Central Bank and the Government; The Classical Paradigm- Price and Wage Rigidities - Voluntary and Involuntary Unemployment.

Text Books

1. Pindyck, Robert S., and Daniel L. Rubinfeld, "Microeconomics", Pearson, Eigth Edition, 2012.
2. Dornbusch, Fischer and Startz, "Macroeconomics", Tata McGraw Hill, Twelfth Edition, 2018.
3. Paul Anthony Samuelson, William D. Nordhaus, "Economics", Tata McGraw Hill, Nineteenth Edition, 2010.

Reference Books

1. Hal R, Varian, "Intermediate Microeconomics: A Modern Approach", W.W. Norton & Company, Eighth Edition, 2010.
2. N. Gregory Mankiw, Principles of Macroeconomics, Cengage, Eighth Edition, 2015.
3. Case, Karl E., and Ray C. Fair, "Principles of microeconomics", Pearson Education, Thirteenth Edition, 2020.
4. Koutsoyiannis, Anna. Modern microeconomics. Springer, Second Edition, 1975.
5. McConnell, Campbell R., Stanley L. Brue, and Sean Masaki Flynn, "Economics: Principles, problems, and policies", Boston McGraw-Hill/Irwin, 21st Edition, 2018.
6. Froyen, Richard T., and Stephen J. Perez, "Macroeconomics: Theories and policies", Macmillan, 1990.
7. Goodwin, Neva, et al, "Macroeconomics in context", ME Sharpe, Third Edition, 2013.

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1. http://economics.mit.edu/
2. http://hbswk.hbs.edu/
3. http://www.cbsnews.com/moneywatch/
4. http://mruniversity.com/
5. http://www.economist.com/
6. http://www.bloomberg.com/
7. http://www.moneyweek.com/

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

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

U20BST216	LINEAR ALGEBRA	L	T	P	C	Hrs
		3	2	0	4	60

Course Objectives

- To familiarize the concept of Linear algebra.
- To know determinant of a matrix and the solution of simultaneous linear equations.
- To learn linear dependence and linear independence in vector space.
- Understand the characteristics of matrices.
- To acquaint with the concepts of differential and integral calculus.

Course Outcomes

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

CO1 - Analyse the concepts of Linear Algebra. **(K2)**

CO2 - Solve systems of linear equations **(K3)**

CO3 - Recognize and use basic properties of subspaces and vector spaces, Identify the dimension of a vector space. **(K2)**

CO4 - Find Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices. **(K3)**

CO5 - Evaluate double integral and triple integral. **(K2)**

UNIT I MATRICES **(12 Hrs)**

Introduction to Matrices and Determinants; Solution of Linear Equations; Cramer's rule; Inverse of a Matrix.

UNIT II VECTORS **(12 Hrs)**

Vectors and linear combinations; Rank of a matrix; Gaussian elimination; LU Decomposition; Solving Systems of Linear Equations using the tools of Matrices.

UNIT III VECTOR SPACE **(12 Hrs)**

Vector space, Subspace, Dimension, Geometric interpretations, Linearly independent. Basis, Orthogonality.

UNIT IV EIGEN VALUES AND EIGEN VECTORS **(12 Hrs)**

Eigenvalues and Eigenvectors; Positive definite matrices; Linear transformations; Hermitian and unitary matrices.

UNIT V CALCULUS **(12 Hrs)**

Basic concepts of Differential and integral calculus, application of double and triple integral.

Content beyond Syllabus

Singular value decomposition and Principal component analysis; Introduction to their applications in Image Processing and Machine Learning.

Text Books

1. B. S. Grewal, Khanna Publishers, "Higher Engineering Mathematics", Khanna Publication, Delhi 4th Edition,2015
2. Gregory Hartman, "Fundamentals of Matrix Algebra", Virginia Military Institute, Copyright Year: 2011, Publisher: APEX Calculus.
3. G. Balaji, "Linear Algebra and Partial Differential Equations: Balaji Publisher,3rd Edition 2017.

Reference Books

1. Peter V. O'Neil, "Advanced Engineering Mathematics", (Seventh Edition), Cengage Learning,7th Edition 2011.
2. Michael. D. Greenberg, "Advanced Engineering Mathematics", Pearson, 2nd Edition 2013.
3. Gilbert Strang, "Introduction to linear algebra", (Fifth Edition), Wellesley-Cambridge Press,2016
4. P. N. Wartikar & J. N. Wartikar, "Applied Mathematics" (Vol. I & II), Pune Vidyarthi GrihaPrakashan, 2010.
5. M. D. Greenberg," Advanced Engineering Mathematics", Pearson Education, (Second Edition).

Web References

1. https://machinelearningmastery.com/introduction-matrices-machine-learning/
2. https://nptel.ac.in/courses/108/104/108104112/
3. https://nptel.ac.in/courses/111108098/
4. https://youtu.be/wo - Vag3yls

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

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

U20BST217	STATISTICAL METHODS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn basic concepts of a few statistical and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- It is framed to address the issues and the principles of estimation theory.
- To learn the concept of testing of hypothesis using statistical analysis.
- Identify the direction and strength of a linear correlation between two factors.
- Analyze the data on agriculture field experiments using various types of designs they learned.

Course Outcomes

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

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

CO2 - Consistency, efficiency and unbiasedness of estimators, method of maximum likelihood estimation and Central Limit Theorem. **(K3)**

CO3 - Apply the concept of testing of hypothesis for small and large samples in real life problems. **(K2)**

CO4 - Concept of linear regression, correlation, and its applications. **(K3)**

CO5 - List the guidelines for designing experiments and recognize the key historical figures in Design of Experiments. **(K3)**

UNIT I MEASURES OF DISPERSION **(9 Hrs)**

Standard Deviation – Mean Deviation – Quartile Deviation – Range –Measures of Skewness and Pearson's coefficient of skewness– Moments about the arbitrary origin and moments based on measures of skewness and kurtosis.

UNIT II ESTIMATIONTHEORY **(9 Hrs)**

Estimators: Unbiasedness, Consistency, Efficiency and sufficiency – Maximum likelihood estimation – Method of moments.

UNIT III TESTING OF HYPOTHESIS **(9 Hrs)**

Sampling distributions – Small and large samples –Tests based on Normal, t, Chi square, and F distributions for testing of means, variance and proportions — Contingency table (test for independent) Goodness of fit.

UNIT IV CORRELATION AND REGRESSION **(9 Hrs)**

Correlation –Rank correlation– Regression –Multiple and partial correlation – Method of least squares – Plane of regression – Coefficient of multiple correlation – Coefficient of partial correlation.

UNIT V DESIGN OF EXPERIMENTS **(9 Hrs)**

Analysis of variance – One way and two-way classifications – Completely randomized design – Randomized block design – Latin square design - 2^2 Factorial design.

Text Books

1. Richard A. Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.
2. Murray R. Spegel, Larry J. Stephens, "Schaum's Outlines- Statistics" Mc. Graw Hill Education, 6th Edition ,2017.
3. Gupta. S. C., and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 11th Edition, 2002.
4. Mood, A.M., Graybill, A.M. and Boes, D.C. (1974): "Introduction to theory of Statistics", McGraw Hill.
5. Johnson, R.A. and Wichern, D. W. "Applied Multivariate Statistical Analysis", Pearson Education, Asia, 6th Edition, 2007.

Reference Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi,10th Edition, 2019.
2. Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10th Edition, Khanna Publishers, New Delhi, 2015.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
4. Dr. G. Balaji "Statistics and Numerical methods" Balaji publication, 11th Edition, 2017.

Web References

1. https://nptel.ac.in/courses/110/105/110105087/
2. https://nptel.ac.in/courses/111/105/111105077/
3. https://www.coursera.org/learn/basic-statistics
4. https://www.youtube.com/watch?v=k3lUo0XYG3E

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

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

U20EST251	PRINCIPLES OF ELECTRONICS	L	T	P	C	H
		2	0	0	2	45

Course Objectives

- To introduce the concepts of semiconductor physics
- To introduce the concepts of semiconductor diodes to understand in detail the operation, characteristics and various parameters of diodes.
- To gain insight into the operation, characteristics and functional aspects of BJT in different configurations.
- To understand in depth the construction, operation, characteristics and various parameters of JFET and MOSFET.
- To understand operation of feedback amplifiers, oscillator circuits and operational amplifiers

Course Outcomes

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

CO1 - Understand the basic Semiconductor Theory concepts **(K2)**
CO2 - Understand the characteristics and applications of diodes **(K2)**
CO3 - Understand the working principle and characteristics of BJTs **(K2)**
CO4 - Describe the working principle and characteristics of JFET and MOSFETs **(K2)**
CO5 - Characterize and analyse the applications of feedback amplifiers, Oscillators and operational amplifiers. **(K2)**

UNIT I SEMICONDUCTORS: CRYSTALLINE MATERIAL **(9 Hrs)**

Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers.

UNIT II DIODES AND DIODE CIRCUITS **(9 Hrs)**

Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

UNIT III BIPOLAR JUNCTION TRANSISTORS **(9 Hrs)**

Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor

UNIT IV FIELD EFFECT TRANSISTORS **(9 Hrs)**

Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles

UNIT V FEEDBACK AMPLIFIER, OSCILLATORS AND OPERATIONAL AMPLIFIERS (9 Hrs)

Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feedback: instability and oscillation, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator

Digital Electronics Fundamentals: Difference between analog and digital signals, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters.

Text Books

1. Adel S. Sedra and Kenneth Carless Smith, "Microelectronics Circuits", Oxford University Press, Fourth Edition, 1998.
2. Jacob Millman, Christos Halkias, Chetan Parikh, "Millman's Integrated Electronics", McGraw Hill Education, Second Edition,2009.
3. M. Morris Mano, "Digital Logic & Computer Design", Pearson, 2006.
4. Jacob Millman, Arvin Grabel, "Microelectronics", Indian Edition, Second Edition, 2017.
5. A.Anand Kumar, Fundamentals of Digital Circuits, 4th Edition PHI Learning Private Limited, 2016

Reference Books

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson, Eleventh Edition, 2013.
2. Ben Streetman, Sanjay Banerjee, "Solid State Electronic Devices", Prentice Hall, 6th Edition, 2015.
3. Albert Paul Malvino, "Electronic Principle", Tata Mc Graw Hill, Seventh Edition, 2013.
4. D Schilling C Belove T Apelewicz R Saccardi, "Electronics Circuits:Discrete & Integrated", Indian Edition,Third Edition, 2002.
5. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, "Electronics Devices & Circuits", Tata Mc Graw Hill, Third Edition, 2012.

Web References

1. https://www.electronics-tutorials.ws/
2. https://www.tutorialspoint.com/basic_electronics/index.htm
3. https://www.electronicshub.org/tutorials/
4. https://nptel.ac.in/courses/122/106/122106025/
5. https://www.worldscientific.com/worldscibooks/10.1142/10998

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	-	1	-	-	-	-	-	-	-	-	-	1	-	-
2	2	-	1	-	-	-	-	-	-	-	-	-	1	-	-
3	2	-	1	-	-	-	-	-	-	-	-	-	1	-	-
4	2	-	1	-	-	-	-	-	-	-	-	-	1	-	-
5	2	-	1	-	-	-	-	-	-	-	-	-	1	-	-

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

U20CBT201 DATA STRUCTURES AND ALGORITHMS

L	T	P	C	H
2	2	0	3	45

Course Objectives

- To understand performance analysis of an algorithm
- To learn linear data structures
- To learn non-linear data structures
- To understand and sorting, searching and hashing algorithms
- To learn file organization and accessing methods

Course Outcomes

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

CO1 - Understand the usage and analysis of algorithms in computing. **(K1)**
CO2 - Implement and apply linear data structures to solve various problems **(K3)**
CO3 - Represent and apply non-linear data structures to solve real time problems **(K2)**
CO4 - Develop and analyse algorithms for sorting and searching data organized in linear and non-Linear data structures **(K3)**
CO5 - Understand various file organization and accessing methods **(K2)**

UNIT I CONCEPTS OF ALGORITHM AND DATA ORGANISATION **(9 Hrs)**

Algorithm specification – Recursion - Performance analysis - Asymptotic Notation - The Big-O - Omega and Theta notation - Programming Style - Refinement of Coding - Time-Space Trade Off – Testing - Data Abstraction

UNIT II LINEAR DATA STRUCTURE **(9 Hrs)**

Array - Stack - Queue - Linked-list and its types - Various Representations - Operations & Applications of Linear Data Structures

UNIT III NON-LINEAR DATA STRUCTURE **(9 Hrs)**

Trees - Binary Tree - Threaded Binary Tree - Binary Search Tree – B-Tree - B+ Tree - AVL Tree - Splay Tree. Graphs: Basic Terminologies - Directed – Undirected - Various Representations - Operations - Graph search and traversal algorithms - complexity analysis - Applications of Non-Linear Data Structures.

UNIT IV SEARCHING AND SORTING ON VARIOUS DATA STRUCTURES **(9 Hrs)**

Sequential Search - Binary Search - Comparison Trees - Breadth First Search - Depth First Search Insertion Sort - Selection Sort - Shell Sort - Divide and Conquer Sort - Merge Sort - Quick Sort- Heapsort - Introduction to Hashing

UNIT V FILE CONCEPTS **(9 Hrs)**

File Organisation – Sequential – Direct - Indexed Sequential - Hashed and various types of accessing schemes.

Text Books

1. E. Horowitz, S. Sahni, S. A-Freed, "Fundamentals of Data Structures", Universities Press, Second Edition, 2008.
2. A. V. Aho, J. E. Hopperoft, J. D. Ullman, "Data Structures and Algorithms", Pearson, First Edition, 2003.
3. Gregory L. Heilman, Data Structures, Algorithms and Object Oriented Programming, Tata Mcgraw-Hill, New Delhi, 2002.
4. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
5. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures & Algorithms, Pearson Education, New Delhi, 2006

Reference Books

1. Donald E. Knuth, "The Art of Computer Programming: Volume 1: Fundamental Algorithms", Third Edition, Dorling Kindersley Pvt Ltd, Third Edition, 1997.
2. Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", The MIT Press,Third Edition,2009 .
3. Pat Morin, "Open Data Structures: An Introduction (Open Paths to Enriched Learning)", UBC Press, Thirty First Edition, 2013.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://nptel.ac.in/courses/106/102/106102064/
3. https://www.geeksforgeeks.org/data-structures/
4. https://www.javatpoint.com/data-structure-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	-	-	-	-	-	-	-	-	-	-	-	1	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	2	1	-
3	2	1	-	-	-	-	-	-	-	-	-	-	2	1	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-
5	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-

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

U20BSP218 STATISTICAL METHODS LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To familiarize the concept of Mean, median, mode and Standard deviation.
- To know Correlation and Regression analysis
- Learn the concept of single mean, difference of mean.
- To understand sampling distribution.
- To introduce the concepts of ANOVA classification.

Course Outcomes

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

CO1 - Gain knowledge in the concepts of statistical methods and models. **(K2)**
CO2 - Trained for data collection on various fields of survey enabling them to classify them statistically. **(K3)**
CO3 - Familiarized in various statistical software. **(K3)**
CO4 - Find the correlation between two variables. **(K2)**
CO5 - Compute regression lines. **(K3)**

List of Experiments:

1. Descriptive Statistics.
2. Test for Single mean.
3. Test for difference of mean.
4. Standard Deviation.
5. Sampling distributions.
6. ANOVA One-way Classification.
7. Two-way ANOVA.
8. Chi-Square Test.
9. Correlation and Regression (Simple and Multiple).
10. Maximum likelihood estimation.

Web References

1. https://www.mathworks.com/help/matlab/ref/std.html
2. https://www.mathworks.com/help/stats/mle.html
3. https://www.mathworks.com/help/stats/two-way-anova.html
4. https://youtu.be/ullVTCmQdpI
5. www.youtube.com/watch?v=ullVTCmQdpI

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

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

U20ESP252	PRINCIPLES OF ELECTRONICS LABORATORY	L	T	P	C	H
		0	0	2	1	30

Course Objectives

- To give a thorough knowledge of Various Diodes
- To make the student to understand BJT Modes of Operations and Characteristics
- To enable the student to understand JFET and MOSFET Characteristics
- To design and measure frequency response, signal handling capacity, input and output impedances of various types of amplifiers
- To design and construct low ad frequency oscillator circuits
- To construct and study the application of operational amplifier

Course Outcomes

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

CO1 - Understand the basic operations of various diodes with VI Characteristics **(K1)**
CO2 - Analyse the various characteristics of JFET and MOSFET **(K1)**
CO3 - Use the diodes such as Rectifiers, Voltage regulators, Clippers and Logic gates **(K1)**
CO4 - Design low and high frequency generation of oscillators. **(K2)**
CO5 - Construct the applications of operational amplifier. **(K3)**

LIST OF EXPERIMENTS

1. V-I characteristics of semiconductor diodes
   a) PN Junction diode
   b) Point contact diode
   c) Zener diode
2. Characteristics of BJT in CB configuration
   a) Determination of input and output characteristics
   b) Determination of voltage gain, current gain, input and output resistances from the characteristics
3. Characteristics of BJT in CE configuration
   a) Determination of input and output characteristics
   b) Determination of voltage gain, current gain, input and output resistances from the characteristics
4. Characteristics of JFET
   a) Determination of output and transfer characteristics
   b) Determination of pinch off voltage, rd, gm and μ from the characteristics
5. Characteristics of MOSFET
   a) Determination of output and transfer characteristics
   b) Determination of pinch off voltage, rd, gm and μ from the characteristics
6. Rectifier and Voltage Regulators
   a) Determination of ripple factor for different types of rectifiers with and without filters.
   b) Voltage regulation characteristics of shunt, series and IC regulators
7. Design and measurement of frequency response, signal handling capacity, input and output impedances of CE amplifier.
8. Design and measurement of frequency response, signal handling capacity, input and output impedances of common source and common drain FET amplifier.
9. To design, construct and study the low frequency and high frequency oscillators.
10. Applications of Op-amp : To study the application of Opamp IC741 as
    a) Inverting amplifier
    b) Non-inverting amplifier
    c) Voltage follower
    d) Summer
    e) Subtractor

Reference Books

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson, Eleventh Edition, 2013.
2. Robert L. Boylestad, "Electronic Devices and Circuit Theory", Pearson, 11th edition 2015
3. L. K. Maheshwari, M. M. S. Anand, "Laboratory Manual for Introductory Electronics Experiments", New Age International (P) Ltd, 2012
4. Ramakant A.Gayakwad, OP-AMP and Linear IC's , Prentice Hall of India, 2012.
5. D.RoyChoudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2016

Web References

1. https://www.industrial-electronics.com/experiments_0.html
2. https://www.electronics-tutorials.ws/
3. http://www2.ece.ohio-state.edu/ee327/
4. http://www.vlab.co.in/broad-area-electronics-and-communications
5. https://www.worldscientific.com/worldscibooks/10.1142/10998

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

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

		L	T	P	C	H
U20CBP201	DATA STRUCTURES & ALGORITHMS LABORATORY	0	0	2	1	30

Course objectives

- To apply linear data structures
- To apply non-linear data structures
- To understand the different operations on trees
- To implement graph traversal algorithms
- To access non-linear data structure from a file

Course Outcomes

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

CO1 - Solve the given problem by identifying the appropriate Data Structure. **(K3)**
CO2 - Implement and apply trees to improve accessing of data **(K3)**
CO3 - Apply graph to solve various real time problems **(K3)**
CO4 - Analyze the algorithm's / program's efficiency in terms of time and space complexity. **(K3)**
CO5 - Use linear data structures while solving simple and complex problems **(K3)**

LIST OF EXPERIMENTS

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.
3. Line editors with line count, word count showing on the screen.
4. Trees with all operations.
5. All graph algorithms.
6. Saving / retrieving non-linear data structure in/from a file

Text Books

1. E. Horowitz, S. Sahni, S. A-Freed ,"Fundamentals of Data Structures", Universities Press.
2. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
3. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures & Algorithms, Pearson Education, New Delhi, 2006

Reference Books

1. Donald E. Knuth,"The Art of Computer Programming: Volume 1: Fundamental Algorithms", Pearson,Third Edition, 2005.
2. Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", The MIT Press,Third Edition,2009 .
3. Pat Morin, "Open Data Structures: An Introduction (Open Paths to Enriched Learning)", UBC Press, Thirty First Edition, 2013.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/dsa_quick_guide.htm
2. https://www.programiz.com/dsa
3. http://cse01-iiith.vlabs.ac.in/

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	-

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

		L	T	P	C	Hrs
U20CBC1XX	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.

U20CBM101

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 and Universal Human Values • Familiarization with College, Dept./Branch • Literary Activity • Proficiency Modules • Lectures and 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 chose 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 dont's, 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 and 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.

U20CBS201	SKILL DEVELOPMENT COURSE 1	L	T	P	C	Hrs
		0	0	2	0	30

DEMONSTRATION OF WORKSHOP PRACTICES

Course Content:

List of Exercises – Civil Engineering

1. Calculate the area of a built-up space and a small parcel of land- Use standard measuring tape and digital distance measuring devices
2. Use screw gauge and vernier calliper to measure the diameter of a steel rod and thickness of a flat bar
3. Transfer the level from one point to another using a water level
4. Set out a one room building with a given plan and measuring tape
5. Find the level difference between any two points using dumpy level
6. Construct a 1 ½ thick brick wall of 50 cm height and 60 cm length using English bond. Use spirit level to assess the tilt of walls.
7. Estimate the number of different types of building blocks to construct this wall.
8. Introduce the students to plumbing tools, different types of pipes, type of connections, traps, valves, fixtures and sanitary fittings.
9. Install a small rainwater harvesting installation in the campus

List of Exercises – Mechanical Engineering

1. General: Introduction to workshop practice, Safety precautions, Shop floor ethics, Basic First Aid knowledge.
2. Study of mechanical tools, components and their applications:
    a. Tools: screw drivers, spanners, Allen keys, cutting pliers etc and accessories
    b. Bearings, seals, O-rings, circlips, keys etc.
3. Carpentry : Understanding of carpentry tools
    a. T –Lap joint
    b. Cross lap joint
    c. Dovetail joint
    d. Mortise joints
4. Foundry : Understanding of foundry tools
    a. Bench Molding
    b. Floor Molding
    c. Core making
    d. Pattern making
5. Sheet Metal : Understanding of sheet metal working tools
    a. Cylindrical shape
    b. Conical shape
    c. Prismatic shaped job from sheet metal
6. Fitting : Understanding of tools used for fitting
    a. Square Joint
    b. V- Joint
    c. Male and female fitting
7. Plumbing : Understanding of plumbing tools, pipe joints ,joining of pipes making use of minimum three types of pipe joints

8. Smithy: Understanding of tools used for smithy.Demonstrating the forge-ability of different materials (MS, Al, alloy steel and cast steels) in cold and hot states. Observing the qualitative difference in the hardness of these materials
    a. Square prism
    b. Hexagonal headed bolt
    c. Hexagonal prism
    d. Octagonal prism
9. Welding: Understanding of welding equipments
    a. Making Joints using electric arc welding. bead formation in horizontal, vertical and over head positions
10. Assembly: Dissembling and assembling of
    a. Cylinder and piston assembly
    b. Tail stock assembly
    c. Bicycle
    d. Pump or any other machine
11. Machines: Demonstration and applications of the following machines
12. Shaping and slotting machine; Milling machine; Grinding Machine; Lathe; Drilling Machine.
13. Modern manufacturing methods: Power tools, CNC machine tools, 3D printing, Glass cutting.

		L	T	P	C	Hrs
U20CBM202	ENVIRONMENTAL SCIENCE	2	0	0	0	30

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two type of activities.

(a) Awareness Activities:

i. Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
ii. Slogan making event
iii. Poster making event
iv. Cycle rally
v. Lectures from experts

(b) Actual Activities:

i) Plantation
ii) Gifting a tree to see its full growth
iii) Cleanliness drive
iv) Drive for segregation of waste
v) To live some big environmentalist for a week or so to understand his work
vi) To work in kitchen garden for mess
vii) To know about the different varieties of plants
viii) Shutting down the fans and ACs of the campus for an hour or so