SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.E-Electronics and Communication Engineering

CURRICULUM and SYLLABI

[For students admitted in 2021-2022]

B.E / B.Tech Regulation 2019

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem

(An Autonomous Institution)

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

Branch: Electronics and Communication Engineering

S.No	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
Theory								
1	U19ENG101B	English For Engineers - I	1	0	2	2	HS	45 (15L+30P)
2	U19MAT102B	Linear Algebra and Multivariable Calculus	3	1	0	4	BS	60
3	U19PHY103C	Engineering Physics	3	0	0	3	BS	45
4	U19CHE104C	Chemistry of Organic Electronics	4	0	0	4	BS	60
5	U19PPR105	Problem Solving using Python Programming	3	0	0	3	ES	45
6	U19BEE106B	Basic Electrical and Electronics Engineering	3	0	0	3	PC	45
Practical								
7	U19PPL111	Python Programming Laboratory	0	0	2	1	ES	30
8	U19BEEL113B	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	PC	30
9	U19GE101	Basic Aptitude - I	0	0	2	0	EEC	30
Total Credits						**21**		
Optional Language Elective*								
10	U19OLE1101	French	0	0	2	1	HS	30
11	U19OLE1102	German						30
12	U19OLE1103	Japanese						30

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

Approved By

Chairperson, Science and Humanities BoS	**Chairperson, Electronics and Communication Engineering BoS**	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr. M. Renuga	**Dr. R.S. Sabeenian**	**Dr. R. Shivakumar**	**Dr. S. R. R. Senthil Kumar**

Copy to:-HOD/ Electronics and Communication Engineering, First Semester BE ECE Students and Staff, COE

06.10.2021 **B.E/B. Tech Regulations-2019**

Sona College of Technology, Salem – 636 005
(An Autonomous Institution)
Courses of Study for BE / B Tech Semester II under Regulations 2019 (CBCS)
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
Theory								
1	U19ENG201B	English for Engineers-II	2	0	0	2	HSMC	30
2	U19MAT202C	Transforms and Differential Equations	3	1	0	4	BSC	60
3	U19PHY203B	Physics for ECE	2	0	0	2	BSC	30
4	U19EGR206A	Engineering Graphics	2	0	2	3	ESC	60 (30L+30P)
5	U19EC201	Electronic Devices and Circuits	2	0	2	3	PCC	60 (30L+30P)
6	U19EC202	Circuit Theory	3	0	0	3	PCC	45
Practical								
7	U19WPL212	Workshop Practice	0	0	2	1	ESC	30
8	U19PCL208B	Physics and Chemistry Laboratory	0	0	4	2	BSC	60
9	U19GE201	Basic Aptitude - II	0	0	2	0	EEC	30
Total Credits						**20**		
Optional Language Elective*								
10	U19OLE1201	French	0	0	2	1	HSMC	30
11	U19OLE1202	German						
12	U19OLE1203	Japanese						

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

Approved by

	4/6/2021		
Chairperson, Science and Humanities BoS	**Chairperson, Electronics and Communication Engineering BoS**	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr. M. Renuga	**Dr. R.S. Sabeenian**	**Dr. R. Shivakumar**	**Dr. S. R. R. Senthil Kumar**

Copy to:-HOD/ Electronics and Communication Engineering, Second Semester BE ECE Students and Staff, COE

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19MAT301C	Probability and Stochastic Processes	3	1	0	4	60
2	U19EC301	Signals and Systems	3	1	0	4	60
3	U19EC302	Digital Electronics	3	0	0	3	45
4	U19EC303	Electronic circuits	3	0	0	3	45
5	U19CS307	Programming in C	3	0	0	3	45
6	U19GE303	**Mandatory Course:** Essence of Indian Traditional knowledge	2	0	0	0	30
Practical							
7	U19EC304	Digital Electronics laboratory	0	0	2	1	30
8	U19EC305	Electronic Circuits and Simulation laboratory	0	0	2	1	30
9	U19CS308	C programing laboratory	0	0	2	1	30
10	U19GE301	Soft Skills and Aptitude – I	0	0	2	1	30
					Total Credits	**21**	

Approved By

Chairman, Electronics and Communication Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.S.Sabeenian	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Electronics and Communication Engineering, Third Semester BE ECE Students and Staff, COE

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19EC401	Engineering Electromagnetics	3	0	0	3	45
2	U19EC402	Linear Integrated Circuits	3	0	0	3	45
3	U19EC403	Digital Signal Processing	3	0	0	3	45
4	U19EC404	Analog Communication Systems	3	0	0	3	45
5	U19CS406	Data Structures	3	0	0	3	45
6	U19GE402	**Mandatory Course :** Environment and Climate Science	2	0	0	0	30
Practical							
7	U19EC405	Linear Integrated Circuits Laboratory	0	0	2	1	30
8	U19EC406	Digital Signal Processing Laboratory	0	0	2	1	30
9	U19CS407	Data Structures Laboratory	0	0	2	1	30
10	U19GE401	Soft Skills and Aptitude – II	0	0	2	1	30
Total Credits						**19**	

Approved By

Chairperson, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

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

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HOD/Electronics and Communication Engineering, Fourth Semester BE ECE Students and Staff, COE

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

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1	U19EC501	Microprocessors and Microcontroller		3	0	0	3	45
2	U19EC502	Control Systems		3	0	0	3	45
3	U19EC503	Transmission Lines and Waveguides		3	0	0	3	45
4	U19EC504	Digital Communication		3	0	0	3	45
5	U19EC505	VLSI Design		3	0	0	3	45
6	noc23_cs74	**NPTEL**	Programming in Java	3	0	0	3*	45
	noc23_cs83		Introduction to Internet of Things					
Practical								
7	U19EC506	Microprocessors and Microcontroller laboratory		0	0	2	1	30
8	U19EC507	Communication Systems laboratory		0	0	2	1	30
9	U19EC 508	VLSI Design laboratory		0	0	2	1	30
10	U19GE501	Soft Skills and Aptitude - III		0	0	2	1	30
						Total Credits	**22**	**390**

*Any 1 elective to be opted by a student among 2 electives.

Approved By

05/07/2023

Chairperson, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

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

Copy to:-

HOD/Electronics and Communication Engineering, Fifth Semester BE ECE Students and Staff, COE

ECE
VI

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

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1.	U19EC601	Antenna and Wave Propagation		3	0	0	3	45
2.	U19EC602	Digital Image Processing		3	0	0	3	45
3.	U19EC603	Embedded Systems		3	0	0	3	45
4.	U19EC901	Professional Elective	FPGA Based System Design (Lab Integrated)	2	0	2	3*	60
	U19EC904		Machine learning (Lab Integrated)					
5.	U19EC912	Professional Elective	Smart sensors for wearable applications	3	0	0	3**	45
	U19EC913		Computer Networks					
	U19EC928		IoT and Sensors					
6.	U19BM1001	Open Elective - I	Hospital Management	3	0	0	3#	45
	U19CE1002		Municipal Solid Waste Management					
	U19CS1001		Big Data Analytics					
	U19CS1002		Cloud Computing					
	U19EE1001		Electric Mobility					
	U19EE1002		Energy Conservation and Management					
	U19EE1003		Innovation, IPR and Entrepreneurship Development					
	U19EE1004		Renewable Energy Systems					
	U19FT1001		Fundamentals of Fashion Design					
	U19FT1002		Garment Manufacturing Technology					
	U19IT1004		Introduction to Database Technology					
	U19MC1004		Fundamentals of Robotics					
	U19ME1004		Renewable Energy Sources					

Practical							
7	U19EC604	Digital Image Processing laboratory	0	0	2	1	30
8	U19EC605	Embedded Systems laboratory	0	0	2	1	30
9	U19EC606	Mini Project	0	0	2	1	30
10	U19GE601	Soft Skills and Aptitude - IV	0	0	2	1	30
Total Credits						**22**	**405**

***Any 1 elective to be opted by a student among 2 professional electives**

****Any 1 elective to be opted by a student among 3 professional electives**

 # Any 1 elective to be opted by a student among 13 open electives

Approved By 22/12/2023

Chairperson, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar 26/12/23

28/12/23
Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electronics and Communication Engineering, Sixth Semester BE ECE Students and Staff, COE

Sona College of Technology, Salem-5

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

Department:- Electronics and Communication Engineering

S.No	Course Code	Course Name	L	T	P	C
1.	U19EC901	FPGA Based System design (Lab Integrated)	2	0	2	3
2.	U19EC902	Advanced Digital System design	3	0	0	3
3.	U19EC903	Nano Electronics	3	0	0	3
4.	U19EC904	Machine learning (Lab Integrated)	2	0	2	3
5.	U19EC905	Artificial Neural Networks	3	0	0	3
6.	U19EC906	Advanced digital signal processing	3	0	0	3
7.	U19EC907	Speech Processing	3	0	0	3
8.	U19EC908	Radar Engineering	3	0	0	3
9.	U19EC909	Satellite Communication	3	0	0	3
10.	U19EC910	Advanced microcontrollers	3	0	0	3
11.	U19EC911	IoT System architecture	3	0	0	3
12.	U19EC912	Smart sensors for wearable applications	3	0	0	3
13.	U19EC913	Computer Networks	3	0	0	3
14.	U19EC914	Wireless Network	3	0	0	3
15.	U19EC915	Wireless sensor Networks	3	0	0	3
16.	U19EC916	Virtual Instrumentation	3	0	0	3
17.	U19EC917	Measurements and Instrumentation	3	0	0	3
18.	U19EC918	Biomedical Instrumentation	3	0	0	3
19.	U19EC919	Computer system Architecture	3	0	0	3
20.	U19EC920	Low power VLSI Design	3	0	0	3
21.	U19EC921	Pattern Recognition	3	0	0	3
22.	U19EC922	Deep Learning	3	0	0	3
23.	U19EC923	Natural Language Processing	3	0	0	3
24.	U19EC924	RF MEMS	3	0	0	3
25.	U19EC925	Electromagnetic Interference and Electromagnetic Compatibility	3	0	0	3
26.	U19EC926	RF Circuit Design	3	0	0	3
27.	U19EC927	Smart Sensors for Wearable applications	3	0	0	3
28.	U19EC928	IoT and Sensors	3	0	0	3
29.	U19EC929	Web page and Mobile App Development	3	0	0	3
30.	U19EC930	Network Security	3	0	0	3
31.	U19EC931	Wireless Adhoc Network	3	0	0	3
32.	U19EC932	Cognitive Radio Network	3	0	0	3

SONA COLLEGE OF TECHNOLOGY (AUTONOMOUS), SALEM

DEPARTMENT OF ECE

LIST OF PROFESSIONAL ELECTIVES FOR HONOR DEGREE

Date : 5.5.23

S.NO	Vertical-I Advanced Communication Technologies	Vertical-II Smart Sensors and IoT	Vertical-III Nanoscience for Modern Industries	Vertical-IV Signal analysis and computer vision	Vertical-V Semiconductor chip design and testing
1.	Mobile Communication Technologies	Fundamentals of IOT	Nano Electronics for Modern Industries	Image Analysis and Computer Vision	Verilog HDL
2.	Optical Communication Networks	Sensors and Wearable Technology	Synthesis & Characterization of Nanomaterials	Machine Learning	VLSI Physical Design
3.	5G Communication	IOT for system design	PCB Design	Sparse Signal and Image processing	Testing of VLSI circuits
4.	Millimetre Wave Communication	Industrial IoT and Networking	Nano Sensors and Transducers	Deep Learning for image analysis	Synthesis and Verification of VLSI circuits
5.	Communication Network Security	Real Time Operating System.	Nanotechnology in Food Preservation and Safety Management	Pattern Recognition	System on Chip Design
6.	5G and its applications	IOT design using Raspberry PI	PCB manufacturing	Artificial Intelligence of Real-time Image Processing	Low-power IC Design
7.	Advanced Wireless Communication	ARM RISC architecture	Nano Technology in the Textile and Agriculture industry	Natural Language Processing	Validation and testing technology
8.	Software Defined Radio	Smart system design using MSB 430 controller	Nanomaterials for Energy and Environment Applications	Biomedical signal and Image Processing	Analog IC Design
9.	Project- Advanced Communication Technologies	Project- Smart Sensors and IoT	Project- Nanoscience for Modern Industries	Project- Signal analysis and computer vision	Project- Semiconductor chip design and testing

SONA COLLEGE OF TECHNOLOGY, SALEM-5

Department of Electronics and Communication

Honors and Minor - Verticals & Courses

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

[1]. HONOURS degree courses

Vertical 1: Advanced Communication Technologies

S.No	Course Code	Course Name	L	T	P	C
1.	U19EC2001	Mobile Communication Technologies	3	0	0	3
2.	U19EC2002	Optical Communication Networks	2	0	2	3
3.	U19EC2003	5G Communication	3	0	0	3
4.	U19EC2004	Millimetre Wave Communication	3	0	0	3
5.	U19EC2005	Communication Network Security	3	0	0	3
6.	U19EC2006	5G and its Applications	3	0	0	3
7.	U19EC2007	Advanced Wireless Communication	3	0	0	3
8.	U19EC2008	Software Defined Radio	3	0	0	3
9.	U19EC2009	Project- Advanced Communication Technologies	0	0	6	3
Maximum of two SWAYAM courses in the **Advanced Communication Technologies** vertical identified and approved by the department consultative Committee of the department. SWAYAM courses should have to cover at least 80% of the prescribe course.						

Vertical 2: Smart Sensors and IoT

S.No	Course Code	Course Name	L	T	P	C
1.	U19EC2010	Fundamentals of IOT	3	0	0	3
2.	U19EC2011	Sensors and Wearable Technology	3	0	0	3
3.	U19EC2012	IOT for system design	2	0	2	3
4.	U19EC2013	Industrial IoT and Networking	3	0	0	3
5.	U19EC2014	Real Time Operating System.	3	0	0	3
6.	U19EC2015	IOT design using Raspberry PI	3	0	0	3
7.	U19EC2016	ARM RISC architecture	3	0	0	3
8.	U19EC2017	Smart system design using MSB 430 controller	3	0	0	3
9.	U19EC2018	Project- Smart Sensors and IoT	0	0	6	3
Maximum of two SWAYAM courses in **Smart Sensors and IoT** vertical identified and approved by the department consultative Committee of the department. SWAYAM courses should have to cover at least 80% of the prescribe course.						

Vertical 3: Nanoscience for Modern Industries

S.No	Course Code	Course Name	L	T	P	C
1.	U19EC2019	Nano Electronics for Modern Industries	3	0	0	3
2.	U19EC2020	Synthesis & Characterization of Nanomaterials	3	0	0	3
3.	U19EC2021	PCB Design	2	0	2	3
4.	U19EC2022	Nano Sensors and Transducers	3	0	0	3
5.	U19EC2023	Nanotechnology in Food Preservation and Safety Management	3	0	0	3
6.	U19EC2024	PCB manufacturing	3	0	0	3
7.	U19EC2025	Nano Technology in the Textile and Agriculture industry	3	0	0	3
8.	U19EC2026	Nanomaterials for Energy and Environment Applications	3	0	0	3
9.	U19EC2027	Project- Nanoscience for Modern Industries	0	0	6	3
Maximum of two SWAYAM courses in **Nanoscience for Modern Industries** vertical identified and approved by the department consultative Committee of the department. SWAYAM courses should have to cover at least 80% of the prescribe course.						

Vertical 4: Signal analysis and computer vision

S.No	Course Code	Course Name	L	T	P	C
1.	U19EC2028	Image Analysis and Computer Vision	3	0	0	3
2.	U19EC2029	Machine Learning	2	0	2	3
3.	U19EC2030	Sparse Signal and Image processing	3	0	0	3
4.	U19EC2031	Deep Learning for image analysis	3	0	0	3
5.	U19EC921	Pattern Recognition	3	0	0	3
6.	U19EC2032	Artificial Intelligence of real-time Image Processing	3	0	0	3
7.	U19EC923	Natural Language Processing	3	0	0	3
8.	U19EC2033	Biomedical signal and Image Processing	3	0	0	3
9.	U19EC2034	Project- Signal analysis and computer vision	0	0	6	3
Maximum of two SWAYAM courses in **Signal analysis and computer vision** vertical identified and approved by the department consultative Committee of the department. SWAYAM courses should have to cover at least 80% of the prescribe course.						

Vertical 5: Semiconductor chip design and testing

S.No	Course Code	Course Name	L	T	P	C
1.	U19EC2035	Verilog HDL	2	0	2	3
2.	U19EC2036	VLSI Physical Design	3	0	0	3
3.	U19EC2037	Testing of VLSI circuits	3	0	0	3
4.	U19EC2038	Synthesis and Verification of VLSI circuits	3	0	0	3
5.	U19EC2039	System on Chip Design	3	0	0	3
6.	U19EC2040	Low-power IC Design	3	0	0	3
7.	U19EC2041	Validation and testing technology	3	0	0	3
8.	U19EC2042	Analog IC Design	3	0	0	3
9.	U19EC2043	Project- Semiconductor chip design and testing	0	0	6	3

Maximum of two SWAYAM courses in **Semiconductor chip design and testing** vertical identified and approved by the department consultative Committee of the department.
SWAYAM courses should have to cover at least 80% of the prescribe course.

SONA COLLEGE OF TECHNOLOGY, SALEM-5

Department of ECE

Minor Degree- Verticals & Courses

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

Minor Vertical : Wearable Technologies

S.No	Course Code	Course Name	L	T	P	C
1	U19EC2044	Microcontroller and Embedded Systems	2	0	2	3
2	U19EC2045	Textile Science: Smart Fibers and Yarns	3	0	0	3
3	U19EC2046	Wearable Technology and IOT	3	0	0	3
4	U19EC2047	Wearable Biomedical Devices and Its Applications	3	0	0	3
5	U19EC2048	Introduction to Data Analytics	3	0	0	3
6	U19EC2049	Basics of Sensors and their Wearable Application	3	0	0	3
7	U19EC2050	Webpage and Mobile App Development for IoT	3	0	0	3
8	U19EC2051	Project -Wearable Technologies	0	0	6	3

Sona College of Technology, Salem

(An Autonomous Institution)

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

Branch: Electronics and Communication Engineering

S.No	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
Theory								
1	U19ENG101B	English For Engineers - I	1	0	2	2	HS	45 (15L+30P)
2	U19MAT102B	Linear Algebra and Multivariable Calculus	3	1	0	4	BS	60
3	U19PHY103C	Engineering Physics	3	0	0	3	BS	45
4	U19CHE104C	Chemistry of Organic Electronics	4	0	0	4	BS	60
5	U19PPR105	Problem Solving using Python Programming	3	0	0	3	ES	45
6	U19BEE106B	Basic Electrical and Electronics Engineering	3	0	0	3	PC	45
Practical								
7	U19PPL111	Python Programming Laboratory	0	0	2	1	ES	30
8	U19BEEL113B	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	PC	30
9	U19GE101	Basic Aptitude - I	0	0	2	0	EEC	30
Total Credits						**21**		
Optional Language Elective*								
10	U19OLE1101	French	0	0	2	1	HS	30
11	U19OLE1102	German						30
12	U19OLE1103	Japanese						30

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

Approved By

Chairperson, Science and Humanities BoS	**Chairperson, Electronics and Communication Engineering BoS**	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr. M. Renuga	**Dr. R.S. Sabeenian**	**Dr. R. Shivakumar**	**Dr. S. R. R. Senthil Kumar**

Copy to:-HOD/ Electronics and Communication Engineering, First Semester BE ECE Students and Staff, COE

06.10.2021 **B.E/B. Tech Regulations-2019**

U19ENG101B - ENGLISH FOR ENGINEERS – I
Common to CSE, ECE, EEE, MCT, BME

L	T	P	C
1	0	2	2

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

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

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

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

TOTAL: 45 Hours

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

TEXT BOOK:

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

Extensive Reading

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

Reference

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

U19MAT102B - LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS

Common to ECE and BME

L	T	P	C
3	1	0	4

COURSE OUTCOMES

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

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

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

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

UNIT – I VECTOR SPACES 12

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

UNIT – II EIGEN VALUES AND EIGEN VECTORS 12

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

UNIT – III FUNCTIONS OF SEVERAL VARIABLES 12

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

UNIT – IV MULTIPLE INTEGRALS 12

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

UNIT – V VECTOR CALCULUS 12

Vector differentiation: Scalar and vector valued functions – Gradient, directional derivative, divergence and curl – Scalar potential.

Vector integration: Line, surface and volume integrals – Statement of Green's, Stoke's and Gauss divergence theorems – Simple applications involving squares, rectangles, cubes and rectangular parallelopiped.

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

U19PHY103C - ENGINEERING PHYSICS
(For BE Electronics and Communication Engineering)

L	T	P	C
3	0	0	3

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

- **CO1** Discuss the dual nature of matter and radiation and the application of wave nature of particles.
- **CO2** Describe the basic components of lasers.
- **CO3** Analyse the relation between arrangement of atoms and material properties.
- **CO4** Differentiate the electrical and thermal conductivity of metals.
- **CO5** Elucidate the classification and theory of semiconducting materials.

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

COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO – 1	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 2	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 3	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO – 4	3	2	-	-	-	-	-	-	-	-	2	2	-	3
CO - 5	3	2	-	-	-	-	-	-	-	-	2	2	-	3

UNIT I - QUANTUM PHYSICS 9

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

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

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

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

UNIT II - LASERS 9

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

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

Types of lasers - Solid lasers (Nd:YAG) - Gas lasers (CO_2 laser) - semiconductor laser (homojunction and hetero junction laser).

Holography - Construction and reconstruction of hologram.

UNIT III - CRYSTAL PHYSICS **9**

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

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

UNIT IV - CONDUCTING MATERIALS **9**

Usage of conducting materials - basic definitions (electrical resistance - conductance - resistivity - conductivity).

Classical free electron theory of metals - Postulates of classical free electron theory - microscopic form of Ohm's law - Electrical conductivity - definition and expression for electrical conductivity - Thermal conductivity - definition and expression for thermal conductivity - Wiedemann - Franz law and Lorentz number - Success and failure of classical free electron theory.

Quantum free electron theory - Drawbacks of quantum free electron theory - origin of energy bands - band theory of solids (qualitative treatment only) - Fermi energy and Fermi distribution function - Effect of temperature on Fermi function - Density of energy states - carrier concentration in metals.

UNIT V - SEMICONDUCTING MATERIALS **9**

Properties of semiconductors - Classification of semiconductors - Intrinsic and extrinsic semiconductors - Elemental and compound semiconductors.

Intrinsic semiconductor - Two types of charge carriers - Energy band diagram of intrinsic semiconductors (at $T= 0$ K and $T > 0$ K) - Expression for number of electrons in conduction band - Expression for number of holes in valence band - Law of mass action and intrinsic carrier concentration - Fermi level - Variation of Fermi level with temperature - electrical conductivity - band gap determination.

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

TOTAL: 45 Hours

TEXT BOOKS

- M.N.Avadhanulu, 'Engineering Physics' S.Chand & Company Ltd, New Delhi (2015)
- B. K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning India Pvt. Ltd., Delhi, 2019

REFERENCES

- Engineering Physics, Sonaversity, Sona College of Technology, Salem (Revised Edition 2018).
- Rajendran, V, and Marikani A, 'Materials science' TMH Publications, (2004) New Delhi.
- Palanisamy P.K, 'Materials science', SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)
- K. Bhattacharya, Poonam Tandon "Engineering Physics" Oxford University Press 2017.

U19CHE104C - CHEMISTRY OF ORGANIC ELECTRONICS
(For ECE)

L	T	P	C
4	0	0	4

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

- **CO1** Outline the basic principles of organic electronic materials.
- **CO2** Analyze the types of various advanced materials and their uses.
- **CO3** Describe the construction, working principle of conducting polymeric materials.
- **CO4** Demonstrate the synthetic methods of conducting polymers.
- **CO5** Outline the modern applications of organic materials.

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

UNIT I - INTRODUCTION TO ORGANIC ELECTRONIC MATERIALS 12

Introduction to organic electronic materials and their basic properties; charge transport and energy structure of organic materials; Optical properties of organic electronic materials-energy levels, color change, light emission (fluorescence and phosphorescence) and absorption-electrochemical properties of organic electronic materials - Liquid crystalline small molecules and polymers-basic properties of liquid crystalline molecules.

UNIT II - ADVANCED MATERIALS FOR ORGANIC ELECTRONICS 12

Pentacene transistors – performance - Engineered pentacenes – Reversible functionalization – end - substituted derivatives – perifunctionalized pentacenes – Heteropentacenes - Various types of graphene nano ribbons (GNRs) - simple synthesis and structure property relationships - Electronic properties of graphene and GNRs - General applications of graphene-based materials.

UNIT III - INTRODUCTION TO CONDUCTING POLYMERIC MATERIALS 12

Conduction mechanism in conductive polymers e.g. Polyaniline (PANI) and Polypyrrole (PPY), polythiophene - Concept of Polarons and solitons. Doping process in conducting polymers- optoelectronic functions of conducting polymeric materials-Electro active (redox type) conducting polymers-Various general applications of conducting polymers.

UNIT IV - SYNTHESIS OF CONDUCTING POLYMERS **12**

Synthesis, structure, morphology, conductivity doping, theory and uses of Poly (sulfur nitride), polyacetylene, polyphenylene, poly(para-phenylene), poly (phenylenevinylenes), poly(phenylene sulfide), Polypyrrole and Polythiophene, Polyaniline, Stacked Phthalocyanine polymers - Polymers with transition metals in the side-group structure and their uses.

UNIT V - MODERN APPLICATIONS OF ORGANIC MATERIALS **12**

Construction working principle and applications of organic materials: Organic solar cells (OSCs) - dye sensitized solar cell, bulk heterojunction solar cell, perovskite solar cell – Organic light emitting diode (OLED) - Organic field effect transistor (OTFT) – Graphene nano ribbons (GNRs) - thermoelectric generators - basic principle - device configuration-general device fabrication techniques.

TOTAL: 60 Hours

TEXT BOOKS

- Hagen Klauk, Organic Electronics: Materials, Manufacturing and Applications, Wiley – VCH. Weinheim, 2006.
- C. Saravanan et al, “Chemistry of Organic Electronics”, Sonaversity, Sona College of Technology, Salem, 2019.

REFERENCE BOOKS

- Kiichi Takemoto, Raphael M. Ottenbrite, MikiharuKamachi, “Functional Monomers and Polymers”, CRC Press, New York.
- Kaiser A B, Electronic properties of conjugated polymers, basics, models and applications, Springer verlag, Berlin.
- Chilton J A and Goosey M T, Special polymers for electronics and optoelectronics, Kluwer Academic Pub. London.

U19PPR105 - PROBLEM SOLVING USING PYTHON PROGRAMMING
(Common to BME, CSE, ECE, EEE, IT and MCT)

L	T	P	C
3	0	0	3

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

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	1	2	2	1	3	2	3	3
CO2	3	3	3	3	3	2	1	1	1	1	1	3	1	3	3
CO3	3	3	3	3	3	3	2	1	1	1	1	3	1	3	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	1	3	2	3	3

UNIT I - ALGORITHMIC PROBLEM SOLVING 9

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

UNIT II - BASICS OF PYTHON PROGRAMMING 9

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

UNIT III - CONTROL STATEMENTS AND STRINGS 9

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

UNIT IV - FUNCTIONS AND FILES **9**

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

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

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

TOTAL: 45 Hours

TEXT BOOK

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

REFERENCES

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

U19BEE106B - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to ECE and BME)

L	T	P	C
3	0	0	3

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

1. Realize the basic concepts of electrical quantities and components.
2. Understand the working of electrical machines.
3. Analyze the construction and characteristics of semiconductor devices.
4. Examine the BJT formation and its characteristics.
5. Enhance the knowledge on Special Devices

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

COS	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	1	3	1	1	2	3	2	2		1	2	3	3	2
CO2	1	1	2	2	1	3	2	1		3	1	3	1	
CO3	1	3	2	3	2	3	2	2		3	2	3	3	2
CO4	1	2	2	3	2	3	2	1		3	2	3	3	2
CO5	1	2	2	3	2	3	2	1		3	2	3	3	2

UNIT I – BASICS OF ELECTRICAL PERCEPTIONS 9

Definition of Electric Voltage, Current, Power, Power factor and Energy, Ohms law, Kirchhoff's Laws and its applications-Frequency-AC & DC Signals-types of sources-single phase-three phase- Resistance- Inductance-capacitance- Series and parallel combinations.

UNIT II - ELECTRICAL MACHINES 9

DC Generator: construction of DC Machine – working principle of DC Generator – EMF equation – Types of DC Generator. DC Motor: Working principle of DC Motor – Types of DC Motor.Transformer: Working principle of Transformer – EMF equation – Transformation ratio.

UNIT III - PN JUNCTION DIODE AND ITS APPLICATIONS 9

Energy band theory-Conductor-Insulator-Semiconductor-Doping-formation of N-type and P-type materials-PN junction Diode – V-I Characteristics- Zener diode- VI characteristics of Zener-Avalanche break down. - Zener effect-Zener diode as voltage regulator.

UNIT IV - BJT AND ITS APPLICATIONS **9**

Bipolar Junction Transistor – construction-Working principle-Regions of transistor-CB, CE, CC Configurations and Characteristics –Transistor as a switch – Applications of transistor.

UNIT V - SPECIAL DEVICES **9**

Construction and Characteristics of - Tunnel Diode-Varactor diode-Photo diode- Photo transistor- SCR-TRIAC-DIAC

Total: 45 hours

TEXT BOOKS

1. D P Kothari and I J Nagrath, "Basic Electrical and Electronics Engineering", Mc Graw Hills (India) Private Limited, 2014.

REFERENCE BOOKS

1. D. Devaraj, S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson India, 2016
2. AbhiChakrabarti, Sudipta Debnath, Soumitra Kumar Mandal, "Basic Electrical & Electronics Book ",Mc Graw Hill Education; Fifth Edition, 2016.
3. Ravish Singh, " Basic Electrical & Electronics Engineering", McGraw Hill Education, 2014

U19PPL111 - PYTHON PROGRAMMING LABORATORY
(Common to BME, ECE, CSE, EEE, IT and MCT)

L	T	P	C
0	0	2	1

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

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	0	1	2	2	1	2	3	3	3
CO2	3	3	3	3	2	2	0	1	2	2	1	2	3	3	3
CO3	3	3	3	3	2	2	0	1	2	2	1	3	3	3	3

LIST OF EXPERIMENTS

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

TOTAL: 30 Hours

U19BEEL113B - BASIC ELECTRICAL AND ELECTRONICS LABORATORY
(Common to ECE and BME)

L	T	P	C
0	0	2	1

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

1. Identify the active, passive components and measuring instruments.
2. Analysis the electrical quantity at the any point of circuit.
3. Design the circuit based on PN junction diode and BJT.

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

LIST OF EXPERIMENTS

1. Identification of active and passive electronic components.
2. Study on CRO, Ammeter, Voltmeter, Multi-meter, Function Generator, and DSO.
3. Measurement of DC and AC power supply using measuring instruments.
4. Realization and design problems on ohms law.
5. Realization and design problems on KCL, KVL.
6. Mesh and node analysis of circuits.
7. V-I characteristics analysis of PN junction diode.
8. V-I characteristics analysis of Zener diode.
9. Biasing characteristics analysis of BJT using CB, CE and CC Configuration.
10. Realization of transistor as switch.

TOTAL: 30 hours

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

L	T	P	C
0	0	2	0

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

CO1: Solve fundamental problems in specific areas of quantitative aptitude

CO2: Solve basic problems in stated areas of logical reasoning

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

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

1. Quantitative Aptitude and Logical Reasoning

Solving simple problems with reference to the following topics:

a. Numbers – HCF & LCM
b. Decimal fractions
c. Square roots & cube roots
d. Surds & Indices
e. Logarithms
f. Percentage
g. Averages
h. Coding and Decoding & Visual language

2. Verbal Aptitude

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

a. Synonyms
b. Antonyms
c. Verbal analogy
d. Editing passages
e. Sentence filler words

TOTAL: 24 hours

Sona College of Technology, Salem – 636 005
(An Autonomous Institution)
Courses of Study for BE / B Tech Semester II under Regulations 2019 (CBCS)
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
Theory								
1	U19ENG201B	English for Engineers-II	2	0	0	2	HSMC	30
2	U19MAT202C	Transforms and Differential Equations	3	1	0	4	BSC	60
3	U19PHY203B	Physics for ECE	2	0	0	2	BSC	30
4	U19EGR206A	Engineering Graphics	2	0	2	3	ESC	60 (30L+30P)
5	U19EC201	Electronic Devices and Circuits	2	0	2	3	PCC	60 (30L+30P)
6	U19EC202	Circuit Theory	3	0	0	3	PCC	45
Practical								
7	U19WPL212	Workshop Practice	0	0	2	1	ESC	30
8	U19PCL208B	Physics and Chemistry Laboratory	0	0	4	2	BSC	60
9	U19GE201	Basic Aptitude - II	0	0	2	0	EEC	30
Total Credits						**20**		
Optional Language Elective*								
10	U19OLE1201	French	0	0	2	1	HSMC	30
11	U19OLE1202	German						
12	U19OLE1203	Japanese						

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

Approved by

	4/6/2021		
Chairperson, Science and Humanities BoS	**Chairperson, Electronics and Communication Engineering BoS**	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr. M. Renuga	**Dr. R.S. Sabeenian**	**Dr. R. Shivakumar**	**Dr. S. R. R. Senthil Kumar**

Copy to:-HOD/ Electronics and Communication Engineering, Second Semester BE ECE Students and Staff, COE

L T P C
2 0 0 2

U19ENG201B-English for Engineers – II

First year II semester

ECE

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

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

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

UNIT –I

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

UNIT – II

- Prepositions and dependent prepositions
- Understanding short conversations or monologues
- Taking down phone messages, orders, notes etc
- Listening for gist, identifying topic, context or function
- Reading documents for business and general contexts and interpreting graphical representations

UNIT – III

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

UNIT – IV

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

UNIT – V

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

TOTAL: 30 hours

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

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

Extensive Reading

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

Reference

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

B. E. / ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER – II	TRANSFORMS AND DIFFERENTIAL EQUATIONS	L	T	P	C
U19MAT202C		3	1	0	4

COURSE OUTCOMES

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

1. apply the classical method to solve linear ordinary differential equations with constant coefficients.
2. apply the Laplace transforms technique and its properties to solve an ordinary differential equation.
3. express a periodic signal as an infinite sum of sine and cosine wave components using Fourier series.
4. apply the Fourier transform techniques to convert the signal in terms of the frequencies of the waves.
5. find the general and singular solutions of linear and nonlinear partial differential equations.

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

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

UNIT – I ORDINARY DIFFERENTIAL EQUATIONS 12

Linear higher order ordinary differential equations with constant coefficients – Cauchy's and Legendre's homogeneous linear ordinary differential equations – Method of variation of parameters.

UNIT – II LAPLACE TRANSFORMS 12

Laplace transform: Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse function – Initial and final value theorems – Transform of periodic functions.

Inverse Laplace transform: Standard results – Statement of convolution theorem and its applications – Solution of linear second order ordinary differential equations with constant coefficients using Laplace transform.

UNIT – III FOURIER SERIES 12

General Fourier series – Dirichlet's conditions – Change of intervals – Odd and even functions – Half range sine and cosine series – Root mean square – Parseval's identity – Harmonic analysis.

UNIT – IV FOURIER TRANSFORMS 12

Fourier transform pair – Properties – Fourier sine and cosine transforms pair – Properties – Transforms of simple functions – Parseval's identity.

UNIT – V PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Lagrange's partial differential equation – Clairaut's form of partial differential equations – Higher order linear partial differential equation with constant coefficients.

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

TEXT BOOKS:

1. T. Veerarajan, "Transforms and Partial Differential Equations", McGraw Hill Publishers, 3rd Edition, 2016.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCE BOOKS:

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

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Course Code:	**U19PHY203B**	**L T P C**
Course Name:	**Physics for ECE**	**2 0 0 2 100**

(for Electronics and Communication Engineering)

COURSE OUTCOMES:

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

CO1 Illustrate the Divergence and curl of Electrostatic fields.

CO2 Explain polarization process in dielectric materials and their temperature and frequency dependence and the causes of dielectric breakdown.

CO3 Illustrate the Divergence and curl of magnetic field.

CO4 Explain the types of magnetic materials.

CO5 Discuss the novel properties of metallic glasses and nanomaterials.

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

Unit 1 Electrostatics **6**

Electric field - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges.

Divergence and curl of Electrostatic fields – Electric lines of forces – Electric flux – Gauss's law – Divergence of E – Applications of Gauss's law – Curl of E.

Unit 2 Dielectric Materials **6**

Basic definitions – Electric dipole – Electric dipole moment – Electric field – Electric displacement vector - Electrical susceptibility – Dielectric constant.

Dielectric polarization - Electronic, ionic, orientation and space charge polarization - Frequency and temperature dependence of polarization - Internal field – Clausius-Mosotti relation (no derivation) - Dielectric loss - Dielectric breakdown - Uses of dielectric materials (capacitor and transformer) .

Unit 3 Magnetostatics **6**

Magnetic Lorentz force – Magnetic fields – Magnetic Lorentz force – Force experienced by current carrying conductor in magnetic field.

Biot - Savart Law – Steady currents – Magnetic field due to steady current.

Divergence and Curl of B – Straight line currents – Ampere's circuital law – Divergence and curl of B – Applications of Ampere's circuital law – Comparison of Magnetostatics and electrostatics.

Unit 4 Magnetic materials **6**

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

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

Unit 5 New Engineering Materials: **6**

Metallic glasses -Preparation, properties and applications.

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

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

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

Text Book:

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

References:

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

U19EGR206A – ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

Course Outcomes: Upon completion of this course the students will be able to

CO1 Predict the construction of various curves in civil elevation, plan and machine components.

CO2 Analyze the principles of projection of various planes by different angle to project points, lines and planes.

CO3 Draw the principles of projection of simple solid by the axis is inclined to one reference plane by change of position method.

CO4 Understand the interior details of complex components, machineries by sectioning the solid body. Study the development of surfaces for prisms and pyramids.

CO5 Draw the projection of three dimensional objects representation of machine structure and explain standards of orthographic views by different methods.

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

UNIT I – PLANE CURVES (Manual drafting) 06

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

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

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

UNIT III – PROJECTION OF SOLIDS (CAD software) 12

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

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

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

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

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

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

TOTAL: 60 Hours

TEXT BOOKS

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

REFERENCES

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

U19EC201 – ELECTRONIC DEVICES AND CIRCUITS

L	T	P	C
2	0	2	3

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

1. bias the transistors for amplification purpose
2. analyse the working principle of fets
3. analyse the mid-frequency operation of bjt amplifier circuits
4. calculate cut-off frequencies and bandwidth of bjt amplifier circuit
5. design the different types of power supply.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3		2			2	3	2	3	3
CO2	3	3	3	3	3		2			2	3	2	3	3
CO3	3	3	3	3	3		2			2	3	2	3	3
CO4	3	3	3	3	3		2			2	3	2	3	3
CO5	3	3	3	3	3		2			2	3	2	3	3

UNIT I	**POWER SUPPLIES AND RECTIFIERS** Classification of power supplies, Rectifiers - Half-wave, full-wave and bridge rectifiers with resistive load. Regulators using IC 78xx. Analysis for V dc and ripple voltage with C, L, LC and CLC filters.	**6+6**
UNIT II	**TRANSISTOR BIASING** BJT – Need for biasing – Stability factor - Fixed bias circuit, Load line and quiescent point - Stability factors – Different types of biasing circuits - Method of stabilizing the Q point - Advantage of Self bias (voltage divider bias) over other types of biasing- self bias as a constant current circuit.	**6+6**
UNIT III	**FIELD EFFECT TRANSISTORS** JFETs – Drain and Transfer characteristics -Current Equations - Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, Characteristics – Comparison of MOSFET with JFET.	**6+6**
UNIT IV	**FREQUENCY RESPONSE OF AMPLIFIERS** General shape of frequency response of amplifiers - Definition of cut-off frequencies and bandwidth - Low frequency analysis of amplifiers to obtain lower cut-off frequency Hybrid equivalent circuit of BJTs - High frequency analysis of BJT amplifiers to obtain upper cut-off frequency – Gain Bandwidth Product.	**6+6**
UNIT V	**MID-BAND ANALYSIS OF SMALL SIGNAL AMPLIFIERS** CE, CB and CC amplifiers - Method of drawing small-signal equivalent circuit - Miller's theorem - Comparison of CB, CE and CC amplifiers and their uses – Methods of increasing input impedance using Darlington connection and bootstrapping.	**6+6**
		Total: 60

U19EC202 **CIRCUIT THEORY**

L	T	P	C
3	0	0	3

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

1. apply basic laws to calculate the voltage, current and power for ac and dc electric circuit.
2. identify the network topologies of circuits.
3. analyze the dc circuits using network theorems.
4. analyze the resonant circuits and coupled circuits.
5. analyze the two port networks for various parameters.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	3	1	1	-	-	1	1	2	2
CO2	3	3	3	2	1	3	1	1	-	-	1	1	2	2
CO3	3	3	3	2	1	3	1	1	-	-	1	1	2	2
CO4	3	3	3	2	1	3	1	1	-	-	1	1	2	2
CO5	3	3	3	2	1	3	1	1	-	-	1	1	2	2

UNIT I - BASICS OF CIRCUIT ANALYSIS **9**

Review on mesh and nodal analysis – Star Delta Transformation Techniques – Phase Relationship For R, L And C – Impedance, Admittance for R, L And C Elements – Concept of Duality – Dual Network – Graphs of A Network – Trees, Twig, Link and Branches – Incidence Matrix – Tie-Set Matrix Formation and Cut-Set Matrix Formation of a Graph.

UNIT II - CIRCUIT THEOREMS 9

DC analysis : Superposition Theorem – Thevenin's Theorem – Norton's Theorem – Reciprocity Theorem – Maximum Power Transfer Theorem – Tellegen's Theorem – Millman's Theorem.

UNIT III - SERIES RESONANT CIRCUITS AND COUPLED CIRCUITS 9

Resonances: Natural Frequency and Damping Ratio – Series Resonance – Impedance and Phase Angle of a Series Resonance Circuit – Voltages and Currents in a Series Circuit – Quality Factor.Coupled Circuits: Self-Inductance – Mutual Inductance – Dot Conversion – Coupling Coefficient – Ideal Transformer.

UNIT IV - TRANSIENTS **9**

Steady State and Transient Response – DC Response of an R-L Circuit – DC Response of an R-C Circuit – DC Response of an R-L-C Circuit – Sinusoidal Response of R-L Circuit – Sinusoidal Response of R-C Circuit – Sinusoidal Response of R-L-C Circuit.

UNIT V - TWO PORT NETWORKS **9**

Two port Network – Open Circuit Impedance (Z) Parameters – Short Circuit Admittance (Y) Parameters –Transmission (ABCD) Parameters – Hybrid (h) Parameters –Inter Relationship of Different Parameters.

TOTAL: 45 Hours

TEXT BOOK

1. A Sudhakar, Shyammohan S Palli, "*Circuits and Networks Analysis and Synthesis*", Mc-Graw Hill, 2019.

REFERENCES

1. Ravish R Singh," Networks Analysis and Synthesis", Mc-Graw HillEducation, 2019.
2. M.L. Soni and J.C. Gupta, A Course in "*Electrical Circuits Analysis"*, Dhanpat Rai & Co.(P), 2015.
3. G.K. Mithal and Ravi Mittal, *"Network Analysis"*, Khanna Khanna Pub,2017.
4. Umesh Sinha, L.P.Singh,"Circuit and Field Theory", Tech IndiaPublication Series, 2016.
5. Abhijit Chakrabarti, "Circuit Theory Analysis and Synthesis", Dhanpat Rai& CO. (Pvt).Ltd, Educational and technical publishers.

U19WPL212 – WORKSHOP PRACTICE

L	T	P	C
0	0	2	1

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

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

CO2 fabricate the different simple products in above trades.

CO3 produce different joining of metals.

List of Experiments

SECTION 1: FITTING

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

SECTION 2: SHEET METAL

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

SECTION 3: WELDING

Tools and Equipment's – Practice

Arc welding of Butt joint and Lap Joint.

SECTION 4: CARPENTRY

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

TOTAL: 30 Hours

U19PCL208B	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

Course Outcomes

After successful completion of this course, the students should be able to

CO1:	Apply the principles of Optics, Electricity and Elasticity to determine the Engineering properties of materials.
CO2:	Identify hardness and suggest the quality of water suitable for domestic purpose and analyze the concentration of carbonate, bicarbonate and hydroxide present in the given sample of water.
CO3:	Determine the thickness and resistivity of the given copper turn used for house hold applications and determine the amount of pH of house hold water sample and suggest the remedial measures.

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

CO/PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3			1		1					1			2
CO2	3			1		1					1			2
CO3	3			1		1					1			2

Course Assessment methods

Direct		Indirect
Mean of 1st half of Experiment (10) Quiz on 1st half (5) Internal test I (10) Mean of 2nd half of Experiment (10)	Quiz on 2nd half (5) Internal test II (10) RTPS (10) End semester Examination (40)	Course end survey

List of Experiments (Physics part)

1	Determination of the thickness of a thin wire by forming interference fringes using air wedge apparatus.
2	Determination of dispersive power of the prism for various pairs of colors in the mercury spectrum using a spectrometer.
3	Determination of laser wavelength, particle size of lycopodium powder, acceptance angle and numerical aperture of an optical fibre using diode laser.
4	Determination of specific resistance of a given wire using Carey Foster's bridge.
5	Determination of band gap of the given semiconductor diode.
6	Determination of velocity of ultrasonic waves and compressibility of the given liquid using

	ultrasonic interferometer.
7	Determination of wavelength of the prominent colors in the mercury spectrum using a spectrometer.
8	Determination of the Young's modulus of the given material by non-uniform bending method.
9	Determination of coefficient of viscosity of the given liquid by Poiseuille's method.
10	Determination of rigidity modulus of the material using torsion pendulum.
List of Experiments (Chemistry part)	
11	Estimation of hardness of water sample by EDTA method.
12	Estimation of alkalinity of water sample by indicator method.
13	Estimation of copper in brass by EDTA method.
14	Estimation of HCl by pH metry.
15	Determination of iron content in water by spectrophotometric method.
16	Estimation of HCl by conductometry. (HCl vs NaOH)
17	Estimation of mixture of acids by conductometry. (HCl + CH_3COOH vs NaOH)
18	Estimation of ferrous ion by potentiometric titration.
19	Determination of Molecular weight of a polymer by viscosity measurements.
20	Estimation of chromium in waste water.
	Total Hours: 60 Hrs

U19GE201 - BASIC APTITUDE - II

L	T	P	C
0	0	2	0

Course Outcomes: At the end of the course, the students will be able to CO1 solve more elaborate problems than those in BA-I in specific areas of quantitative aptitude.

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

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

List of Experiments

1. **QUANTITATIVE APTITUDE AND LOGICAL REASONING**
   Solving quantitative aptitude and logical reasoning problems with reference to the following topics:
   a. Ratio and proportion
   b. Partnership
   c. Chain rule
   d. Ages
   e. Profit, loss and discount
   f. Geometry
   g. Area and volume
   h. Data arrangement

2. **VERBAL APTITUDE**

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

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

TOTAL : 24 Hours

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19MAT301C	Probability and Stochastic Processes	3	1	0	4	60
2	U19EC301	Signals and Systems	3	1	0	4	60
3	U19EC302	Digital Electronics	3	0	0	3	45
4	U19EC303	Electronic circuits	3	0	0	3	45
5	U19CS307	Programming in C	3	0	0	3	45
6	U19GE303	**Mandatory Course:** Essence of Indian Traditional knowledge	2	0	0	0	30
Practical							
7	U19EC304	Digital Electronics laboratory	0	0	2	1	30
8	U19EC305	Electronic Circuits and Simulation laboratory	0	0	2	1	30
9	U19CS308	C programing laboratory	0	0	2	1	30
10	U19GE301	Soft Skills and Aptitude – I	0	0	2	1	30
					Total Credits	**21**	

Approved By

Chairman, Electronics and Communication Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.S.Sabeenian	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Electronics and Communication Engineering, Third Semester BE ECE Students and Staff, COE

U19EC301 SIGNALS AND SYSTEMS (Common for ECE & BME) 3 1 0 4

Course Outcomes

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

1) Classify the signals as continuous time and discrete time signals and classify systems based on their properties
2) Determine the response of LTI system using convolution sum for DT system and Convolution Integral for CT system
3) Apply Fourier series and Fourier Transform for periodic Signals
4) Analyze system using Laplace transform and realize the structure for CT system
5) Analyze system using Z transform and realize the structure for DT system

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	2	1				1	2	1	3	3
CO2	3	2	2	1		1		2		1	2	1	3	3
CO3	3	3	1		2	1	2	2		1	2	1	3	3
CO4	3	3	2	2		1		2		1	2	1	3	3
CO5	3	3	2	1	2	1	2	2		1	2	1	3	3

Unit I CLASSIFICATION OF SIGNALS AND SYSTEMS 12

Continuous-Time and Discrete-Time signals–The Unit Impulse Unit Step, Unit Ramp Signals and other Basic Signals – Operation of Signals -Time Shifting – Time Reversal – Amplitude Scaling – Time Scaling – Signal Addition – Multiplications – Classification of signals- Continuous-Time and Discrete-Time Systems– Basic System Properties - Systems with and Without Memory – Causality – Stability – Time Invariance – Linearity

Unit II LINEAR TIME- INVARIANT SYSTEMS 12

Continuous-Time LTI Systems: The Convolution Integral - graphical and analytical approach – Properties of Linear Time-Invariant Systems – Solution of Differential Equations. Discrete-Time LTI system: The Convolution sum-tabulation method-matrix multiplication method-graphical and analytical approach – Solution of Difference Equations.

Unit III ANALYSIS OF CT SIGNALS USING FOURIER SERIES & FOURIER TRANSFORM **12**

Fourier Series Representation (Trigonometric and Exponential) of Continuous-Time Periodic Signals – Properties of Continuous-Time Fourier Series – Representation of Aperiodic Signals: The Continuous-Time Fourier Transform – The Fourier Transform for Periodic Signals – Properties of the Continuous-Time Fourier Transform.

Unit IV ANALYSIS OF SIGNALS AND SYSTEMS USING LAPLACE TRANSFORM **12**

The Laplace Transform – The Region of Convergence for Laplace Transform– The Inverse Laplace Transform using Partial fraction– Properties of the Laplace Transform– System Function and Block Diagram Representations-Direct Form I and Direct Form II.

Unit V ANALYSIS OF SIGNALS AND SYSTEMS USING Z-TRANSFORM **12**

The Z-Transform – The Region of Convergence for the Z-Transform –The Inverse Z-Transform using Partial fraction and Long division method– Properties of the Z-Transform – System Function and Block Diagram Representations-Direct Form I and Direct Form II.

TOTAL : 60 HOURS

Text Book

1) Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, "Signals and Systems", 2nd E, Prentice Hall India, 2010

2) A.Anand Kumar, "Signals and Systems", 3rd Edition, Prentice Hall India,2013

References

1) M .J. Roberts, "Signals & Systems Analysis using Transform Methods & MATLAB", Tata McGraw Hill, 2007

2) Haykin, Simon, and Barry Van Veen. "Signals and systems", John Wiley & Sons, 2007. 3. A. NagoorKani, "Signals & Systems", Tata McGraw Hill, 2010

3) John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications", 4th E, PHI, 2007

4) Robert A. Gable, Richard A. Roberts, "Signals & Linear Systems", 3rd E, John Wiley, 1995

5) Edward W Kamen& Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007

U19EC302 **DIGITAL ELECTRONICS** **3 0 0 3**

Course Outcomes

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

1) Explain number systems, logic gates, logic functions and simplify Boolean expressions
2) Design and analyze combinational logic circuits
3) Design of sequential logic circuits
4) Design and implement shift registers and counters
5) Implement combinational circuits using Programmable Logic Devices

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	1	1		2	3	3	3
CO2	3	3	3	3	3	2	2	1	1		2	3	3	3
CO3	3	3	3	3	3	2	2	1	1		2	3	3	3
CO4	3	3	3	3	3	2	2	1	1		2	3	3	3
CO5	3	3	3	3	3	2	2	1	1		2	3	3	3

Unit I NUMBER SYSTEM, BOOLEAN ALGEBRA AND LOGIC GATES **9**

Review of Number systems – Boolean Algebra – Basic Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Digital Logic Gates - NAND and NOR Implementation –Simplification of Boolean functions using K-Map Method – Four Variable K-map – POS Simplification – Don't Care Conditions – Tabulation method– TTL – ECL – CMOS Logic Circuits.

Unit II COMBINATIONAL LOGIC CIRCUITS **9**

Analysis Procedures – Design Procedures – BCD to Excess-3–Parallel Adders and Subtractors – BCD Adder –Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Demultiplexers – Introduction to Verilog HDL – Verilog HDL code for 2 bit adder – 2:1 Multiplexer.

Unit III SEQUENTIAL LOGIC CIRCUITS **9**

Flip-Flops – SR – D- JK-T– Master Slave JK Flip-Flop – Conversion of Flip Flops – Design of Clocked Sequential Circuits – State Diagram – State Table – State Reduction and Assignment

Unit IV REGISTERS AND COUNTERS **9**

Registers – Shift Registers – SISO – SIPO – PIPO — Synchronous Counters – Up-down Binary Counter – Ring Counter – Johnson Counters – Asynchronous Counters – Asynchronous Design Procedure – Race Free State Assignment – Hazards

Unit V MEMORY AND PROGRAMMABLE LOGIC 9

Classification of memories: RAM - Static and Dynamic RAM, ROM - PROM, EPROM, EEPROM - Memory Decoding – Read/Write access - Implementation of combinational logic using PROM - Programmable Logic Array – Programmable Array Logic.

TOTAL : 45 HOURS

Text Book

1) M. Morris Mano and Michael D. Ciletti – '*Digital Design with an Introduction to the Verilog HDL*', 6th Edition, Pearson Education, 2018

References

1) John F Wakerly – '*Digital Design Principles and Practices*', 4th Edition, Prentice Hall India, 2008.
2) Schilling, Herbert Taub and Donald, 'Digital Integrated Electronics', Tata McGraw-Hill, 2008
3) A.Anandkumar, 'Fundamentals of digital circuits, 4th Edition, Prentice Hall India, Paper back'2016
4) Jayaram Bhasker, '*A Verilog HDL Primer'*, 2nd E, BS publications, Paper back'2008.

U19EC303 **ELECTRONIC CIRCUITS** **3 0 0 3**

Course Outcomes

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

1) Design negative feedback amplifier circuits
2) Analyze tuned amplifiers circuits and describe the working of Signal Generators
3) Analyze the operation of multivibrators and wave shaping circuits
4) Design and analyze multistage amplifiers
5) Describe the types of power amplifiers

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

Unit I FEEDBACK AMPLIFIERS **9**

Classification of amplifiers – Feedback concept – Transfer gain with feedback – General characteristics of negative feedback –Negative feedback topologies -Voltage Series feedback – Current Series feedback – Voltage Shunt feedback – Current Shunt feedback - Input resistance – Output resistance – Method of identifying of feedback topology and feedback factor – Nyquist criterion for stability of feedback amplifiers

Unit II TUNED AMPLIFIERS ANDOSCILLATORS **9**

Tuned amplifiers - Q factor – Single tuned – Double tuned – Stagger tuned – Class C tuned - Classification of Oscillators –Barkhausen criterion – General form of LC oscillators – Hartley oscillator-Colpitts oscillators - Clapp oscillators – Analysis of RC oscillators-RC phase shift oscillators-Wien bridge oscillators – Crystal oscillators – Frequency stability of oscillators.

Unit III WAVE SHAPING AND MULTIVIBRATOR CIRCUITS **9**

RC and RL integrator and differentiator circuits - Diode clippers – series and parallel – Diode clampers – positive and negative - Schmitt trigger circuit – Collector coupled multivibrators – Astable multivibrator – Monostable multivibrator - Bistable multivibrator – waveform analysis

Unit IV MULTISTAGE AMPLIFIERS **9**

Different coupling schemes – General analysis of cascade amplifier - Bandpass of cascaded stages – RC coupled amplifier – Low frequency response of RC coupled stage – Effect of an emitter bypass capacitor on low frequency response – Transformer coupled amplifier – Direct coupled amplifier – Differential amplifier.

Unit V LARGE SIGNAL AMPLIFIERS **9**

Classification based on biasing condition - Class A large signal amplifiers – Transformer coupled audio power amplifier – Efficiency – Push-Pull amplifiers – Class B amplifiers – efficiency - Class AB operation – Class D amplifier – Class S amplifier

TOTAL : 45 HOURS

Text Book

1) Salivahanan, Suresh Kumar and Vallavaraj, "Electronic Devices and Circuits", TMH, 3rd edition 2012.

References

1) Dr.Sanjay Sharma – "Electronic Principles"- S.K.Kataria and sons-third edition 2014
2) J. Millman and A.Grabel, "Micro Electronics", second edition, 2009
3) A.S.Sedra and K.C. Smith, "Micro Electronic Circuits", Oxford press, fourth edition, 1998
4) J . Millman and Halkias, "Integrated Electronics", second edition, 2010

Course Outcomes

After successful completion the course, the student will be able to

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	3	1	1	2	1	1	2	3	3
CO2	3	3	3	3	2	3	1	1	2	1	1	2	3	3
CO3	3	3	3	3	2	3	1	1	2	1	1	2	3	3
CO4	3	3	3	3	2	3	1	1	2	1	1	2	3	3
CO5	3	3	3	3	2	3	1	1	2	1	1	2	3	3

Unit I BASICS OF C PROGRAMMING **9**

Introduction to programming paradigms - Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process

Unit II ARRAYS AND STRINGS **9**

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – multi-dimensional array- String – string built-in functions – Sorting- Searching

Unit III FUNCTIONS AND POINTERS **9**

Introduction to functions: Function prototype, function definition, function call-Call by Value-Call by reference – Recursion – user defined functions versus built-in functions- Pointers – Pointer operators –Pointer arithmetic – Arrays and pointers – pointers to an array – function pointer-indirect pointer.

Unit IV STRUCTURES **9**

Structure – Structure definition - Nested structures – Pointer and Structures – Array of structures – Self- referential structures – bit fields- Union-Dynamic memory allocation - Singly linked list – typedef.

Unit V FILE PROCESSING **9**

Files – Types of file- File Primitives- File access mode- Sequential file access - Random file access -Command line arguments-introduction to TSR programs

TOTAL : 45 HOURS

Text Book

1) Ben Clemens "21st Century C ", Second Edition ,Oreilly Media Inc,2014
2) Deitel and Deitel, "C How to Program", Pearson Education, New Delhi, 2011.

References

1) Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
2) Yashavant P. Kanetkar. "Let Us C", BPB Publications, 14th edition, 2016.
3) Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
4) Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5) E. Balagurusamy, "Programming in ANSI C", seventh edition, Tata McGraw Hill, 2016.

U19GE303 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE 2 0 0 0

Course Outcomes

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

1) Analyze the basics of Indian traditional knowledge in modern scientific perspectives
2) Explain the basics of Vedic science and its applications in modern days
3) Discuss the introduction and objectives of modern science
4) Describe the contribution of Noble laurates for India's achievements in Science and Technology
5) Analyze the various traditional practices for holistic health care of human beings

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

Unit I **6**

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

Unit II **6**

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

Unit III Modern Science **6**

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

Unit IV Technology **6**

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

Unit V Yoga and Holistic Health Care **6**

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

TOTAL : 30 HOURS

References

1) V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan,Mumbai, 5th Edition, 2014

2) Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan

3) RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016

4) Roshan Dalal The Vedas: An Introduction to Hinduism's Sacred Texts, Penguin Books 2014. ISBN13: 9780143066385

5) Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN : 9781988207049

Course Outcomes

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

1) Design and implement combinational circuits using logic gates and breadboards
2) Design and implement counter circuits using Flip flops and breadboards
3) Design and implement Shift Registers using Flip flops and breadboards

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	1	1		2	3	3	3
CO2	3	3	3	3	3	2	2	1	1		2	3	3	3
CO3	3	3	3	3	3	2	2	1	1		2	3	3	3

List of Experiments

1) **Design and implementation of**

Half Adder and Full Adder, Half Subtractor and Full Subtractor
4-bit Parallel Adder cum Subtractor
BCD adder
Magnitude Comparator

2) **Design and implementation of**

Code Converters – Binary to Gray and Gray to Binary
BCD to Excess 3 and Excess 3 to BCD

3) **Design and implementation of**

4:1 / 8:1 Multiplexer
1:4 / 1:8 Demultiplexer
Decoder – BCD to Seven Segment
Encoder – 4×2 Priority Encoder
Parity Generator and Checker

4) **Design and implementation of**

3-bit Asynchronous Counter
3-bit Synchronous Counter
4-bit Ring Counter
4-bit Johnson Counter

5) Design and implementation of Shift Registers – SISO, SIPO and PIPO.

TOTAL : 30 HOURS

U19EC305 **ELECTRONIC CIRCUITS AND SIMULATION LABORATORY** **0 0 2 1**

Course Outcomes

After successful completion of this course, the students should be able to

1) Realize feedback amplifiers and power amplifiers from various parameters
2) Design and test Oscillator, multi-vibrator and wave shaping circuits using BJT
3) Obtain the frequency response from single stage, two stage amplifiers and differential amplifier

Pre-requisite

Electronic Devices and Circuits

CO/PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	3	2	2	2	2	2	3	3	3	3
CO2	3	3	2	3	3	2	2	2	2	2	3	3	3	3
CO3	3	3	2	3	3	2	2	2	2	2	3	3	3	3

List of Experiments

1) Design the current series feedback amplifier and calculate the parameters (Gain, Input impedance, Output Impedance, Bandwidth) with and without feedback condition.
2) Design the Voltage shunt feedback amplifier and calculate the parameters (Gain, Input impedance, Output Impedance, Bandwidth) with and without feedback condition.
3) Design RC Phase shift oscillator and obtain the waveform for the frequency of 5 KHz.
4) Design Wien Bridge oscillator and obtain the waveform for the frequency of 10 KHz
5) Design LC oscillator(Hartley and Colpitts) and obtain the waveform for the frequency of 250 KHz.
6) Construct differentiator and integrator circuit by using passive element. Obtain waveform for following input signal

   i) Sine Waveform

   ii) Square Waveform

   iii) Triangular Waveform

7) Design and construct the following passive clipper and clamper circuit. Obtain the output waveform

   i) Series Clipper

   ii) Shunt Clipper

   iii) Combinational Clipper

   iv) Clamping Circuit

8) Design multi-vibrators (Astable ,Monostable and Bistable) using BJT and Obtain the output waveform for the time period of 250 μs.

9) Obtain the frequency response of a two stage RC coupled amplifier

10) Design and test a differential amplifier in

   i) Common Mode

   ii) Difference Mode

11) Design Class A amplifier and Class B power amplifiers. Observe the output waveform and measure its efficiency

12) Simulation using PSPICE:

   i) RC phase shift, Hartley, Colpitts oscillators

   ii) Integrator, differentiator

   iii) Clippers and Clampers

   iv) Astable multi-vibrator, Monostable multi-vibrator

TOTAL : 30 HOURS

U19CS308 **C PROGRAMMING LABORATORY** **0 0 2 1**

Course Outcomes

After successful completion of this course, the students should be able to

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2					2		3	3	3	2
CO2	3	3	2	2					2		3	3	3	2
CO3	3	3	2	3					2		3	3	3	3

List of Experiments

1) Programs using Input, Output, and assignment statements
2) Programs using Branching statements
3) Programs using Looping statements
4) Programs using Functions
5) Programs using Arrays
6) Programs using Structures
7) Programs using Strings
8) Programs using Pointers (both data pointers and function pointers)
9) Programs using dynamic memory allocation
10) Programs using Recursion
11) Programs using Files

TOTAL : 30 HOURS

Semester-III	U19 GE301- SOFT SKILLS AND APTITUDE – I	L T P C Marks 0 0 2 1 100
Course Outcomes **At the end of the course the student will be able to:**		
1. Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches		
2. Solve problems of greater intricacy in stated areas of quantitative aptitude and logical reasoning		
3. Demonstrate higher levels of verbal aptitude skills in English with regard to specific topics		
1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics**: a. Attitude building b. Dealing with criticism c. Innovation and creativity d. Problem solving and decision making **e.** Public speaking **f.** Group discussions	
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. **Vedic Maths:** Fast arithmetic, multiplications technique, Criss cross, Base technique, Square root, Cube root, Surds, Indices, Simplification. b. **Numbers:** Types, Power cycle, Divisibility, Prime factors & multiples, HCF & LCM, Remainder theorem, Unit digit, highest power. c. **Averages:** Basics of averages and weighted average. d. **Percentages**: Basics of percentage and Successive percentages. e. **Ratio and proportion:** Basics of R &P, Alligations, Mixture and Partnership. f. **Profit ,Loss and Discount**: Basic & Advanced PLD g. **Data Interpretation**: Tables, Bar diagram, Venn diagram, Line graphs, Pie charts, Caselets, Mixed varieties, Network diagram and other forms of data interpretation. h. **Syllogism:** Six set syllogism using Venn diagram and tick and cross method	
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Verbal analogy b. Tenses c. Prepositions d. Reading comprehension e. Choosing correct / incorrect sentences f. Describing pictures g. Error spotting	

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

Sona College of Technology **Department of Mathematics**

B. E. / ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER – III U19MAT301C	PROBABILITY AND STOCHASTIC PROCESSES	L	T	P	C
		3	1	0	4

COURSE OUTCOMES

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

1. apply the concepts of probability, random variable and their properties to generate the moments.
2. fit the suitable distribution and its properties to the real world problems and interpret the results.
3. apply the concepts of joint probability distribution and its properties to find the covariance and transformation of random variables.
4. make a probabilistic model for characterizing a random signal.
5. find the expected frequency of the random process and analyze the response of random inputs to linear time invariant systems.

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

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

UNIT – I ONE DIMENSIONAL RANDOM VARIABLE **12**

One dimensional random variable (Discrete and continuous) – Probability mass function, probability density function, moments, moment generating function and their properties.

UNIT – II THEORETICAL DISTRIBUTIONS **12**

Binomial, Poisson, Uniform, Exponential and Normal distributions - Function of one dimensional random variable – Applications.

UNIT – III TWO DIMENSIONAL RANDOM VARIABLES **12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation – Transformation of two dimensional random variables – Central limit theorem (for independent and identically distributed random variables).

20. 05. 2020 **B. E. / B. Tech. Regulations 2019**

UNIT – IV RANDOM PROCESSES **12**

Classification – First order, second order, strictly stationary, wide sense and ergodic processes – Poisson process.

UNIT – V SPECTRAL DENSITIES AND LINEAR SYSTEMS WITH RANDOM INPUTS **12**

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

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

TEXT BOOKS:

1. T. Veerarajan, "Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks", McGraw Hill Publishers, 4th Edition, 7th Reprint, 2018.
2. P. Z. Peebles Jr., "Probability, Random Variables and Random Signal Principles", McGraw Hill Publishers, 4th Edition, 37th Reprint, 2016.

REFERENCE BOOKS:

1. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition, Reprint, 2019.
2. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
3. S. Ross, "A First Course in Probability", Pearson Publishers, 9th Edition, 2019.
4. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, Reprint, 2003.
5. W. Feller, "An Introduction to Probability Theory and its Applications – Volume – I", Wiley Publishers, 3rd Edition, 2008.
6. S. S. Haykin and B. Van Veen, "Signals and Systems," Wiley Publishers, 2nd Edition, 2007.

Prof. S. JAYABHARATHI
Head / Department of Mathematics
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Dr. M. RENUGA
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20. 05. 2020 **B. E. / B. Tech. Regulations 2019**

U19GE303 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE 2 0 0 0

Course Outcomes

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

1. Analyze the basics of Indian traditional knowledge in modern scientific perspectives.
2. Explain the basics of Vedic science and its applications in modern days.
3. Discuss the introduction and objectives of modern science.
4. Describe the contribution of Noble laurates for India's achievements in Science and Technology.
5. Analyze the various traditional practices for holistic health care of human beings.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	-	2	-	-	-	-	-	-	-	2
CO2	2	2	2	-	-	2	-	-	-	-	-	-	-	2
CO3	3	2	2	-	-	2	-	-	-	-	-	-	-	2
CO4	3	2	2	-	-	2	-	-	-	-	-	-	-	2
CO5	2	2	2	-	-	2	-	-	-	-	-	-	-	2

Unit I 6

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

Unit II 6

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

UNIT – III- Modern Science 6

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

UNIT – IV Technology 6

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

UNIT – V- Yoga and Holistic Health Care **6**

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

Reference Books

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan,Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi,2016.
4. Roshan Dalal The Vedas: An Introduction to Hinduism's Sacred Texts, Penguin Books 2014. ISBN13: 9780143066385
5. Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN : 9781988207049

Total: 30 hours

29/8/22	29/8/2022	29.8.
M. Raja	**Dr. C. Shanthi**	**Dr. M. Renuga**
Course Coordinator / Sciences	HOD / Sciences	Chairperson BOS, Science and Humanities

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19EC401	Engineering Electromagnetics	3	0	0	3	45
2	U19EC402	Linear Integrated Circuits	3	0	0	3	45
3	U19EC403	Digital Signal Processing	3	0	0	3	45
4	U19EC404	Analog Communication Systems	3	0	0	3	45
5	U19CS406	Data Structures	3	0	0	3	45
6	U19GE402	**Mandatory Course :** Environment and Climate Science	2	0	0	0	30
Practical							
7	U19EC405	Linear Integrated Circuits Laboratory	0	0	2	1	30
8	U19EC406	Digital Signal Processing Laboratory	0	0	2	1	30
9	U19CS407	Data Structures Laboratory	0	0	2	1	30
10	U19GE401	Soft Skills and Aptitude – II	0	0	2	1	30
Total Credits						**19**	

Approved By

Chairperson, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

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

Copy to:-

HOD/Electronics and Communication Engineering, Fourth Semester BE ECE Students and Staff, COE

U19EC401 ENGINEERING ELECTROMAGNETICS 3 0 0 3

Course Outcomes

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

1) Apply the concepts of coordinate system to analyze the geometrical parameters of objects and field quantities
2) Apply the concepts of electrostatics to evaluate the capacitance of parallel plate, coaxial and spherical capacitors.
3) Apply the concepts of magnetostatics to evaluate the inductance of solenoid, toroid and coaxial transmission line
4) Analyze electromagnetic wave propagation in various guiding medium
5) Apply EMI and EMC concepts to solve different implications of EM radiation in practical applications.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	2	3	2	2	1	3	3	3	2
CO2	3	3	3	3	3	2	3	2	2	1	3	3	3	2
CO3	3	3	3	3	3	2	3	2	2	1	3	3	3	2
CO4	3	3	3	3	3	2	3	2	2	1	3	3	3	2
CO5	3	3	3	3	3	3	3	2	2	1	3	3	3	2

Unit I INTRODUCTION TO COORDINATE SYSTEMS **9**

Introduction-Cartesian Co-ordinate System – Vector Components and Unit Vector- Cylindrical Coordinate System – Spherical Coordinate System – transformation of vectors from rectangular coordinates to cylindrical coordinates, cylindrical coordinates to rectangular coordinates, rectangular coordinates to spherical coordinates, spherical coordinates to rectangular coordinates, cylindrical coordinates to spherical coordinates, spherical coordinates to cylindrical coordinates- Curl and Divergence- Divergence theorem and Stokes theorem.

Unit II STATIC ELECTRIC FIELD **9**

Energy Expended in Moving a Point Charge in an Electric Field– Definition of Potential Difference and Potential – Potential Gradient – Potential Field of a Point Charge – Electric field intensity for Dipole – Gauss law for static field- Boundary Conditions for Perfect Dielectric Material – Capacitance – Capacitance for parallel sheet, coaxial and spherical geometries – Derivation of Poisson's and Laplace's Equation.

Unit III STATIC MAGNETIC FIELD **9**

Introduction to magneto statics- Inductance- Inductance of a solenoid-inductance of a Toroid-Energy stored in an inductor- Inductance of a coaxial cable- Inductance of a two wire transmission line-Energy density in a magnetic field- Boundary conditions for a magnetic field- scalar and magnetic vector potential.

Unit IV TIME VARYING FIELDS AND PLANE WAVE **9**

Faraday's Law – Displacement Current – Maxwell's Equation in Point Form – Maxwell's Equation in Integral Form - Poynting's Theorem- EM waves-plane wave-uniform plane wave- derivation of a wave equation for a free space in terms of E & H-Wave equation for a conducting medium-Wave Propagation in good conductor-Skin Effect.

Unit V PRACTICAL IMPLICATIONS OF EM RADIATION **9**

Introduction to EMI and EMC- The Case Study of Electromagnetic Exposure in Railways, the case study of EMI on medical equipment, A Case Study of EMI Elimination and Ground Noise Reduction Using Ground Noise Filters, a case study on EMI in Printed circuit boards.

TOTAL : 45 HOURS

Text Books

1) Matthew N. O. Sadiku and S. V. Kulkarani, "*Principles of Electromagnetics*", 6th Edition Oxford University Press, 2015

References

1) W. H. Hayt and J. A. Buck, "*Engineering Electromagnetics*", TATA McGraw-Hill, 9th Edition, 2019
2) David K Cheng, " Field and wave Electromagnetics", Pearson edition, 2004.
3) John D. Kraus and Daniel A. Fleisch, "*Electromagnetics with Applications*", 5th Edition, McGraw Hill International Editon, 1999
4) E. C. Jordan and K. G. Balmain, "*Electromagnetic waves and Radiating Systems"*, Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1968

Course Outcomes

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

1) Analyze and understand the fundamental operations of Analog ICs
2) Design analog circuits using Op-Amps.
3) Describe the working of Signal Generators.
4) Explain the working of Voltage Reference and Regulator circuits.
5) Analyze the operation of Analog to Digital and Digital to Analog Converters

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

Unit I STATIC AND DYNAMIC OP AMP LIMITATIONS 9

Simplified Op Amp circuit diagram – Constant current source(current mirror) –Widlar current source–Wilson current source– Input Bias and Offset Currents – Input Offset Voltage–Input Offset Error Compensation –Open loop response – Closed loop response – Input and output Impedances – ,Internal frequency Compensation– External frequency Compensation. Active filters – The Transfer function – First-order Active filters – Standard Second order Responses

Unit II OPERATIONAL AMPLIFIER FUNDAMENTALS AND APPLICATIONS 9

Amplifier Fundamentals – The Operational Amplifier – Ideal Op Amp – Basic Op Amp configurations – Non inverting Amplifier – Voltage follower – Inverting Amplifier – Ideal Op Amp circuit Analysis – Summing Amplifier – Difference Amplifier – Differentiator – Integrator– Negative Feedback– Feedback in Op Amp circuits – The Loop Gain – Circuits with Resistive feedback – Current to Voltage converters – Voltage to Current converters – Differential Amplifiers, Instrumentation Amplifiers.

Unit III OPAMP NONLINEAR CIRCUITS AND SIGNAL GENERATORS 9

Voltage comparators – Comparator Applications – Schmitt Triggers – Precision Rectifiers – Analog switches – Peak Detectors – Sample-and-Hold Amplifiers – Log/ Antilog amplifiers – Signal Generators – Sine wave generators – Multivibrators – Astable Multivibrators – Monostable Multivibrators – Monolithic Timers(555) – 555 Timer as an Astable Multivibrator – 555 Timer as an Monostable Multivibrator – Triangular wave generators – Saw tooth wave generators

Unit IV VOLTAGE REFERENCES, REGULATORS AND ANALOG MULTIPLIERS 9

Performance specifications – Voltage References – Band gap voltage references – Voltage Reference Applications – Linear regulators – protections – Monolithic voltage regulators – Linear regulator Applications – Switching regulators – basic topologies – Efficiency – Monolithic switching regulator – Voltage mode control – Current mode control – Analog multiplier –Analysis of four quadrants and Variable transconductance multiplier..

Unit V D-A AND A-D CONVERTERS, PHASE LOCKED LOOP 9

Performance specifications – D-A conversion techniques – Weighted resistor DACs – R-2R Ladders – Current mode R-2R Ladder – Voltage mode R-2R Ladder – Multiplying DAC Applications – A-D conversion techniques – Successive approximation converters – Flash converters – integrating type converters – Over sampling converters – Phase locked loops, Monolithic PLL, Special ICs-Isolation Amplifier IC and Opto Coupler IC

TOTAL : 45 HOURS

Text Book

1) D.Roy Choudhry,Shail jain –"Linear Integrated Circuits"-New age Pub,2018..
2) Sergio Franco –"Design with Operational Amplifiers and Analog Integrated Circuits"-Tata Mc Graw Hill, -2015

References

1) S.Salivahanan and V.S.Kanchana Bhaskaran-"Linear Integrated Circuits "-Tata Mc Graw –Hill -2018
2) Ramakant A.Gayakwad,"Op-Amp and Linear ICs"- Prentice Hall/Pearson Education-2015
3) Gray and Meyer-"Analysis and Design of Analog Integrated Circuits", Wiley international, 2009

U19EC403 **DIGITAL SIGNAL PROCESSING** **3 0 0 3**

Course Outcomes

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

1) Describe DFT , FFT and to perform its computations
2) Design FIR digital filters using various techniques..
3) Design IIR digital filters using different techniques..
4) Analyse the finite word length effects in signal processing
5) Describe the fundamentals of digital signal processors.

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

Unit I DISCRETE FOURIER TRANSFORM AND FFT **9**

Introduction to DFT – Efficient computation of DFT- Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –Fast convolution- overlap save method and overlap add method..

Unit II INFINITE IMPULSE RESPONSE DIGITAL FILTERS **9**

Review of design of analog Butterworth and Chebychev Filters – Design of IIR digital filters using impulse invariance technique – Design of IIR digital filters using bilinear transformation – pre warping – Frequency transformation in digital domain – Realization cascade and parallel form

Unit III FINITE IMPULSE RESPONSE DIGITAL FILTERS **9**

Amplitude and phase responses of FIR filters – Linear phase filters – Windowing techniques for design of linear phase FIR filters: Rectangular- Hamming- Hanning- Gibbs phenomenon –Principle of frequency sampling technique. Realization of FIR filters- Linear and cascade form.

Unit IV FINITE WORD LENGTH EFFECTS **9**

Quantization noise – derivation for quantization noise power- comparison – truncation and rounding error – input quantization error-coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

Unit V DIGITAL SIGNAL PROCESSORS **9**

Architectural Features – Von Neumann architecture- Harvard architecture- Bus Architecture and Memory- Multiplier- Shifter- MAC Unit- ALU- Addressing Modes – Address Generation Unit - pipelining- Overview of instruction set of TMS320C54XX. Introduction of TMS320C6748 Processor

TOTAL : 45 HOURS

Text Book

1) John G Proakis- Dimtris G Manolakis-" *Digital Signal Processing Principles-Algorithms and Application"*- Pearson/PHI- 4th Edition- 2014.
2) B.Venkataramani & M-Bhaskar- "*Digital Signal Processor Architecture- Programming and Application"*- TMH 2017.

References

1) Allan V.Openheim, Ronald W.Sehafer & John R.Buck, "*Discrete Time Signal Processing"*- second edition Pearson/Prentice Hall, 2014.
2) P.Ramesh Babu, **"***Digital Signal Processing*"-SCITECH-2017
3) S.K.Mitra, "*Digital Signal Processing- A Computer based approach*"- Tata McGraw-Hill- 2006- New Delhi
4) S.Salivahanan, A.Vallavaraj, Gnanapriya, "*Digital Signal processing"* - McGraw Hill / TMH,2019

U19EC404 ANALOG COMMUNICATION SYSTEMS 3 0 0 3

Course Outcomes

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

1) Describe the generation and detection methods of various AM systems
2) Explain the Modulation and demodulation methods of FM systems
3) Classify the types of noise and its effect on communication system..
4) Analyze the noise performance of various Analog modulation systems
5) Know the purpose of information theory and the significance of source coding

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	3	1	1	2	2	3	3	2
CO2	3	3	3	3	3	2	3	2	2	2	2	3	3	2
CO3	3	3	3	3	3	2	3	1	1	2	2	3	3	2
CO4	3	3	3	3	3	2	3	1	2	2	2	3	3	2
CO5	3	3	3	3	3	2	3	2	1	2	2	3	3	2

Unit I AMPLITUDE MODULATION SYSTEMS 09

Principles of Amplitude Modulation – Mathematical Expression for Single Tone AM – Powe Relations in AM – Types of AM – DSBSC-SSBSC and VSB – Generation and Detection Methods – Comparison of Various AM Systems – AM transmitters - Low Level and High Level Modulation – AM Receivers – TRF, Super-heterodyne Radio Receiver.

Unit II ANGLE MODULATION SYSTEMS 09

Phase and Frequency Modulation – Principles of FM – Expression for Single Tone FM – Frequency Analysis of FM – Transmission Bandwidth of FM – NBFM and WBFM Generation Methods – Direct Method and Indirect (Armstrong) Method of FM Generation – FM Demodulators – FM Transmitters and Receivers

Unit III NOISE THEORY **09**

Noise – Thermal Noise and Shot Noise – Narrow Band Noise and its Representation using InPhase and Quadrature Components – Noise Figure and its Expression in Terms of SNR – Overall Noise Figure Calculation for Cascaded Amplifiers – Friss Formula – Noise Temperature – Noise Bandwidth – Equivalent Noise Resistance.

Unit IV PERFORMANCE OF CW MODULATION SYSTEMS **09**

Channel SNR – Output SNR – Figure of Merit – Noise in DSBSC and SSBSC Systems using Coherent Detection – Noise in AM System using Envelope Detection – Noise Performance Analysis in FM System – FM Threshold Effect – Threshold Improvement in Discriminators – Pre-Emphasis and De-Emphasis in FM – Noise Performance Comparison between CW Modulation Systems.

Unit V INFORMATION THEORY AND CODING **09**

Amount of Information – Entropy – Information Rate – Source Coding Theorem, Code variance, Redundancy – Shannon-Fano Coding – Huffman Coding , Channel Capacity – BCC – BEC – BSC – Channel capacity Theorem (Shannon's Theorem) — Bandwidth – SNR Trade-Off – Mutual Information
.

TOTAL : 45 HOURS

Text Book

1) Simon Haykins, "Communication Systems", John Wiley & Sons, 4th Edition, 2016..
2) R.P. Singh and S.D. Sapre, "Communication Systems– Analog and Digital", Tata McGrawHill,3rd Edition, 2014

References

1) Wayne Tomasi, "Electronic Communication Systems", 5/e, Pearson Education, 2011.
2) H.Taub, D L Schilling, G Saha, "Principles of Communication", 3/e, 2011.
3) Dr. Sanjay Sharma, "Analog Communication systems", S.K. Kataria & sons, 6th edition, 2013

U19CS406 **DATA STRUCTURES** **3 0 0 3**

Course Outcomes

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

1) Implement abstract data types for linear data structures
2) Solve real world problems using stack and queue linear data structures.
3) Apply various non-linear tree data structures in real time applications
4) Design algorithms to solve common graph problems
5) Analyze various searching, sorting and hashing techniques

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

Unit I **LINEAR DATA STRUCTURES – LISTS** **9**

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation - Singly linked lists - Circularly linked lists - Doubly-linked lists – Applications of lists

Unit II **LINEAR DATA STRUCTURES – STACKS, QUEUES** **9**

Stack ADT – Operations– Evaluating arithmetic expressions - Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Double ended queue – Applications of Stacks and queues..

Unit III **NON LINEAR DATA STRUCTURES – TREES** **9**

Trees – Traversals – Binary Trees – Expression trees – Applications of trees – Binary search trees - AVL Trees – B-Tree – Heap – Applications of heap -Tries.

Unit IV **NON LINEAR DATA STRUCTURES – GRAPHS** **9**

Graphs - Representation of graph – Graph traversals – Breadth-first traversal – Depth-first traversal – Minimum Spanning Trees: Prim's algorithm, Kruskal's algorithm – Shortest path algorithms: Dijkstra's algorithm- Applications of Graphs: Topological Sort

Unit V **SEARCHING, SORTING AND HASHING TECHNIQUES** **9**

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

TOTAL : 45 HOURS

Text Book

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

References

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

Course Outcomes

Upon completion of this course the students will be able to

CO1 Describe the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.

CO2 Illustrate the concepts of an ecosystem and provide an overview of biodiversity and its conservation

CO3 Analyze the causes, effects of various environmental pollution and their appropriate remedial measures

CO4 Provide solutions to combat environmental issues like global warming, acid Rain, ozone layer depletion

CO5 Analyze the effect of climate change in various sectors and their remedial measures

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	2							--
CO2	2	-												--
CO3	3	2				2	2							2
CO4	3	2				2	2							2
CO5	3	2				2	2							2

Unit I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **6**

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

Unit II ECOSYSTEMS AND BIODIVERSITY **6**

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

Unit III ENVIRONMENTAL POLLUTION **6**

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

Unit IV FUNDAMENTALS OF CLIMATE CHANGE **6**

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

Unit V EFFECT OF CLIMATE CHANGE **6**

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

TOTAL : 30 HOURS

Text Book

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

References

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

U19EC405 LINEAR INTEGRATED CIRCUITS LABORATORY 0 0 2 1

Course Outcomes

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

1) Design circuits using Op-amp, PLL and Timer ICs for various applications.
2) Design analog filters using Op-amp
3) Design voltage regulators using IC 723.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3					3	1			3	1
CO2									3	1			3	1
CO3	3	3	3	3					3	1			3	1

List of Experiments

1) Design of Inverting and Non-Inverting amplifier using Opamp (IC 741).
2) Design of Integrator and Differentiator using Opamp (IC 741).
3) Design of Differential amplifier to find CMRR using Opamp (IC 741).
4) Design of Astable and Monostable multivibrator using Opamp IC 741.
5) Design of Schmitt triggers using Opamp (IC 741).
6) Design of Low pass and High pass filters using Opamp (IC 741)..
7) Design of Band pass filters using Opamp (IC 741).
8) Design of RC phase shift and Wein bridge oscillators using Opamp(IC 741).
9) Design of Astable and Monostable multivibrators using IC 555
10) Design of low and high voltage regulator using IC 723
11) Real time case study involving design of IOT data logger, WiFi applications by interfacing with microcontrollers

TOTAL : 30 HOURS

U19EC406 DIGITAL SIGNAL PROCESSING LABORATORY 0 0 2 1

Course Outcomes

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

1) Perform convolution, sampling and FFT operations using MATLAB and DSP Processor.
2) Design FIR and IIR filters using MATLAB and DSP Processor
3) Perform arithmetic operations and generation of signals using DSP Processor

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

List of Experiments

Using MATLAB

1) Generation of Discrete time signals
2) Linear and Circular convolution
3) Auto and Cross Correlation
4) Sampling and effect of Aliasing
5) Design of FIR Filters
6) Design of IIR Filters
7) DFT and FFT
8) Up sampling and Down sampling

Using TMS320C54 Processor

1) Arithmetic operations using DSP
2) Sampling of input signal and display
3) Implementation of FIR Filters
4) Implementation of IIR Filters
5) Linear convolution
6) Generation of Signals
7) Calculation of FFT
8) Study of TMS320C6748 Processor

TOTAL : 30 HOURS

U19CS407 **DATA STRUCTURES LABORATORY** **0 0 2 1**

Course Outcomes

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

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

List of Experiments

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

TOTAL : 30 HOURS

Semester – IV	U19GE401-SOFT SKILLS AND APTITUDE – II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

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

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate greater than SSA-I level of verbal aptitude skills in English with regard to given topics and score 65-70% marks in company-specific internal tests

1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Equations: Basics of equations , Linear, Quadratic Equations of Higher Degree and Problem on ages. b. Logarithms, Inequalities and Modulus c. Sequence and Series: Arithmetic Progression, Geometric Progression, Harmonic Progression, and Special Series. d. Time and Work: Pipes & Cistern and Work Equivalence. e. Time, Speed and Distance: Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks and Escalators. f. Arithmetic and Critical Reasoning: Arrangement, Sequencing, Scheduling, Network Diagram, Binary Logic, and Logical Connection. g. Binary Number System.- Binary to decimal, Octal, Hexadecimal
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Critical reasoning b. Theme detection c. Verbal analogy d. Prepositions e. Articles f. Cloze test g. Company specific aptitude questions

06/01/2023

Dr.S.Anita

Head/Training

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

MANDATORY COURSE

SEMESTER – IV

MANDATORY COURSE

U19GE402 - ENVIRONMENT AND CLIMATE SCIENCE

(Common for MCT, IT,FT,ECE and BME)

L	T	P	C
2	0	0	0

Course Outcomes:

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

1. state the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
2. explain the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
3. explain environmental based pollution their causes, effects and their remedial measures
4. discuss their causes, effects and the control measures of Global Warming, Acid Rain, Ozone Layer Depletion
5. describe the effect of climate change due to pollution

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 6

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

UNIT II ECOSYSTEMS AND BIODIVERSITY 6

Structure and Function of an Ecosystem– Energy Flow in the Ecosystem -Food Chains, Food Webs and Ecological Pyramids.

Introduction to Biodiversity –Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values –India as a Mega-Diversity Nation — Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

UNIT III ENVIRONMENTAL POLLUTION 6

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

UNIT IV CLIMATE CHANGE ON THE ENVIRONMENT 6

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

UNIT V EFFECT OF CLIMATE CHANGE ON POLLUTION 6

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

TOTAL: 30 HOURS

Text Books:

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

References:

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

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

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

Dr. M. Renuga
Chairperson BOS,
Science and Humanities

23.01.2021 **B.E. / B.Tech. Regulations 2019**

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

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1	U19EC501	Microprocessors and Microcontroller		3	0	0	3	45
2	U19EC502	Control Systems		3	0	0	3	45
3	U19EC503	Transmission Lines and Waveguides		3	0	0	3	45
4	U19EC504	Digital Communication		3	0	0	3	45
5	U19EC505	VLSI Design		3	0	0	3	45
6	noc23_cs74	**NPTEL**	Programming in Java	3	0	0	3*	45
	noc23_cs83		Introduction to Internet of Things					
Practical								
7	U19EC506	Microprocessors and Microcontroller laboratory		0	0	2	1	30
8	U19EC507	Communication Systems laboratory		0	0	2	1	30
9	U19EC 508	VLSI Design laboratory		0	0	2	1	30
10	U19GE501	Soft Skills and Aptitude - III		0	0	2	1	30
						Total Credits	**22**	**390**

*Any 1 elective to be opted by a student among 2 electives.

Approved By

05/07/2023

Chairperson, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

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

Copy to:-

HOD/Electronics and Communication Engineering, Fifth Semester BE ECE Students and Staff, COE

U19EC501 MICROPROCESSORS AND MICROCONTROLLER 3 0 0 3

Course Outcomes

After successful completion of this course, the students should be able to

1) Develop assembly language program to solve mathematical problems using 8bit and 16 bit microprocessors.
2) Create a multiprocessor system with 8086 microprocessor
3) Interface I/O and memory devices with 8086 microprocessor
4) Analyze the architecture and signals of 8051 microcontroller
5) Develop a real time system using 8051 microcontroller

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	3	3	2	3	3	1	1	2	1	3	3
CO2	1	2	2	3	2	1	2	3	1	1	2	1	3	2
CO3	2	2	3	2	3	1	2	2	1	1	1	1	3	3
CO4	2	2	2	3	3	3	2	3	1	1	2	1	3	2
CO5	1	2	3	3	3	3	3	2	1	1	1	3	3	2

Unit I 8 BIT AND 16 BIT MICROPROCESSORS 9

8085 Microprocessor Architecture – Instruction Set – Addressing Modes – Assembly Language Programming. 8086 Microprocessor Architecture – Addressing Modes – Instruction Set – Assembly Language Programming.

Unit II MULTIPROCESSOR CONFIGURATION 9

Introduction to Assembler Directives – Stacks – Procedures – Macros – Interrupts and Interrupt Service Routines – Multiprocessor Configurations – Coprocessor – Closely Coupled and Loosely Coupled Configurations

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Unit III **PERIPHERAL INTERFACING WITH 8086µP** 9

Memory Interfacing and I/O Interfacing – Parallel Communication Interface – Serial Communication Interface – D/A and A/D Interface – Timer – Keyboard /Display Controller – Interrupt Controller – DMA Controller – Programming and Applications

Unit IV **8051 MICROCONTROLLER** 9

Introduction – Evolution of Microcontroller - Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction Set - Addressing Modes - Assembly Language Programming – RS232 Bus – Inter Integrated Circuit

Unit V **INTERFACING WITH MICROCONTROLLER** 9

Programming 8051 Timers – Serial Port Programming – Interrupts Programming – LCD and Keyboard Interfacing – ADC- DAC and Sensor Interfacing – External Memory Interface – Case study on interfacing stepper motor- Case study on room temperature monitor.

TOTAL : 45 HOURS

Text Books

1) Soumitra Kumar Mandal, "Microprocessors and Microcontrollers, Architecture, Programming and Interfacing using 8085, 8086 and 8051", McGraw-Hill Companies, 2018.
2) Mohammed Ali Mazidi and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems", Edition-2, Pearson Education Asia, New Delhi, 2008.

References

1) Douglas V Hall, "Microprocessor and Interfacing: Programming and Interfacing", Edition-3Tata McGraw-Hill Companies, 2019.
2) A.K. Ray and K.M.Burchandi, "Intel Microprocessors Architecture Programming and Interfacing", McGraw Hill International Edition, 2006.
3) Kenneth J Ayala, "The 8051 Microcontroller Architecture Programming and Application", Edition3, Penram International Publishers (India), New Delhi, 2007.
4) Ramesh S Gaonkar, "Microprocessor Architecture, Programming and application with 8085", 4th Edition, Penram International Publishing, New Delhi, 2002.
5) M. Rafi Quazzaman, "Microprocessors Theory and Applications: Intel and Motorola", Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

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U19EC502 CONTROL SYSTEMS 3 0 0 3

Course Outcomes

After successful completion of this course, the students should be able to,

1) Derive the transfer function of a given system using mathematical models.
2) Determine the time response of systems and analyze the steady state error
3) Calculate the frequency domain specifications using frequency response plots
4) Determine and analyze the stability of given system
5) Solve the state equations using state space model and obtain the Controllability & Observability of the given system

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

Unit I BASIC CONCEPTS AND SYSTEM REPRESENTATION **9**

Introduction - Open Loop and Closed Loop Systems - Mathematical Model of Control Systems - Transfer Functions - Mechanical Translational System - Mechanical Rotational Systems - Block Diagram Algebra - Signal Flow Graph - Mason's Gain Formula.

Unit II TIME RESPONSE ANALYSIS **9**

Time Response - Standard Test Signals - Type and Order of Control System - Time Response of First Order System for Unit Step - Unit Ramp and Impulse Input - Time Response of Second Order System for Unit Step Input - Time Domain Specifications - Steady State Error and Static Error Constants - Controllers – P - PI and PID

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Unit III **FREQUENCY RESPONSE ANALYSIS** **9**

Frequency Response - Frequency Domain Specifications - Resonant Peak - Resonant Frequeney - Bandwidth- Cut-Off Rate - Gain Margin and Phase Margin - Frequeney Response Plots - Polar Plot - Bode Plot - M and N Circles - Nichol's Chart.

Unit IV **STABILITY ANALYSIS** **9**

The Concepts of Stability - Necessary Conditions for Stability - Relative Stability - Routh Hurwitz Stability Criterion - Root Locus - Effect of Addition of Poles - Effect of Addition of Zeros - Nyquist Stability Criterion.

Unit V **COMPENSATORS AND STATE SPACE ANALYSIS** **9**

Compensators: Introduction - Types – Lag - Lead and Lag-Lead Design using Bode Plots.
State Space Analysis: Concepts of State - State Variables and State Model for Linear Continuous Time Systems - Controllability and Observability.

TOTAL : 45 HOURS

Text Books

1) Samarajit Gosh, *"Control Systems Theory and Applications"*, 2nd New Edition, Pearson publications, 2017
2) I.J.Nagrath and M.Gopal, *"Control Systems Engineering"*, 6th Edition, New Age International (P) Ltd, Publishers, 2017.

References

1) M.Gopal, *"Control Systems, Principles and Design"*, 4th Edition, Tata McGraw Hill, New Delhi, 2014.
2) A.Nagoorkani, *"Control Systems Engineering"*, 3rd Edition, RBA Publications, 2017.
3) S.Palani, *"Control Systems Engineering"*, 3rd Edition, Tata McGraw Hill, 2015
4) Pankaj Swarnkar," *Automatic Control Systems*", 8th Edition, Satya Prakashan Publications,2019.

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U19EC503 TRANSMISSION LINES AND WAVEGUIDES 3 0 0 3

Course Outcomes

After successful completion of this course, the students should be able to

1) Analyse electromagnetic wave propagation in generic transmission line geometries.s
2) Design impedance matching transmission line and calculate the reflection coefficient, SWR, using smith chart.
3) Analyse guided waves and their field pattern between parallel planes of perfect conductors.
4) Design and measure the various propagating modes of rectangular wave guides.
5) Derive the field equation of circular waveguides and resonators

Pre-requisite

Engineering Electromagnetics

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1	1	-	-	-	-	2	2	3	3
CO2	3	3	2	3	3	1	-	-	-	-	2	2	3	3
CO3	3	3	2	3	3	1	-	-	-	-	2	2	3	3
CO4	3	3	2	3	3	1	-	-	-	-	2	2	3	3
CO5	3	3	2	3	3	1	-	-	-	-	2	2	3	3

Unit I TRANSMISSION LINE THEORY 9

Different Types of Transmission Lines – Characteristic Impedance – Propagation Constant- T and ∏ Section Equivalent to Lines – General Solution of the Transmission Line – Standard forms for Voltage and Current of a line terminated by an Impedance – Physical Significance of the equation and the Infinite Line – Standard forms for the Input Impedance of a Transmission Line Terminated by an Impedance – Reflection Coefficient – Wavelength and Velocity of Propagation - Waveform Distortion – Distortion Less Transmission Line – The Telephone Cable – Line Loading - Campbell's Equation - Input Impedance of Lossless Lines – Reflection on a Line Not Terminated By Z0 – Transfer Impedance – Reflection Factor and Reflection Loss – Insertion Loss

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Unit II TRANSMISSION LINE AT RADIO FREQUENCIES 9

Standing Waves and Standing Wave Ratio on a Line – One Eighth Wave Line – The Quarter Wave Line and Impedance Matching – The Half Wave Line – The Circle Diagram for the Dissipation Less Line – The Smith Chart – Application of the Smith Chart – Conversion from Impedance to Reflection Coefficient and Vice -Versa – Impedance to Admittance Conversion and Vice-Versa – Input Impedance of a Lossless Line Terminated by Impedance – Single Stub Matching and Double Stub Matching.

Unit III GUIDED WAVES BETWEEN PARALLEL PLANES 9

Waves Between Parallel Planes of Perfect Conductors – Transverse Electric and Transverse Magnetic Waves – Characteristics of TE and TM Waves – Transverse Electromagnetic Waves –Velocities of Propagation – Component Uniform Plane Waves Between Parallel Planes –Attenuation of TE and TM Waves of Parallel Plane Guides – Wave Impedances.

Unit IV RECTANGULAR WAVEGUIDES 9

Transverse Magnetic Waves in Rectangular Waveguides – Transverse Electric Waves in Rectangular Waveguides – Characteristic of TE and TM Waves – Cutoff Wavelength and Phase Velocity – Impossibility of TEM Waves in Waveguides – Dominant Mode in Rectangular Waveguide – Attenuation of TE and TM Modes in Rectangular Waveguides – Wave Impedances – Characteristic Impedance – Excitation of Modes..

Unit V CIRCULAR WAVE GUIDES AND RESONATORS 9

Bessel Functions – Solution of Field Equations in Cylindrical Co-Ordinates – TM and TE Waves in Circular Guides – Wave Impedances and Characteristic Impedance – Dominant Mode in Circular Waveguide – Excitation of Modes – Microwave Cavities – Rectangular Cavity Resonators – Circular Cavity Resonator – Q Factor of a Cavity Resonator for TE101 Mode.

TOTAL : 45 HOURS

Text Book

1) J.D.Ryder, "Networks, Lines and Fields", Pearson, 2e, 2015
2) E.C.Jordan and K.G.Balmain, "Electro Magnetic Waves and Radiating System", Pearson, 2e, 2015.

References

1) David M.Pozar, "Microwave Engineering", 4th Edition, John Wiley, 2013.
2) Ramo, Whineery and Van Duzer: "Fields and Waves in Communication Electronics" John Wiley, 3e, 2011.
3) R.S. Sabeenian, "Transmission Line and Waveguides", Sonaversity
4) G.S.Raju, Electromagnetic Field Theory and Transmission Lines, 3/e, Pearson Education India, 2012.

05.07.2023

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Regulations- 2019

Course Outcomes

After successful completion of this course, the students should be able to

1) Analyse the sampling process and different types of digital pulse modulation techniques
2) Describe the baseband pulse transmission and ISI
3) Derive the bit error probability of digital modulation techniques.
4) Compute the code vectors for different error control coding techniques
5) Calculate the performance parameters of spread spectrum modulation methods

Pre-requisite

Basic idea of Signals and Systems, analog modulation and probability theory

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

Unit I PULSE MODULATION **9**

Sampling Process – Signal Distortion and Recovery – PAM - PWM – PPM - Pulse Code Modulation – Noise Considerations in PCM Systems – Delta Modulation – Differential Pulse Code Modulation – Adaptive DPCM – Adaptive DM - Digital Multiplexer - Applications of PWM.

Unit II BASEBAND PULSE TRANSMISSION **9**

Matched Filter – Error Rate Due to Noise – Line Coding Formats – Inter -Symbol Interference – Nyquist's Criterion for Distortion Less Base Band Binary Transmission - Correlative Level Coding – Base Band M- ary PAM – Adaptive Equalization – Eye Patterns

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Unit III PASS BAND DATA TRANSMISSION 9

Introduction – Pass Band Transmission Model – Generation and Detection – Signal Space Diagram – Bit Error Probability – Power Spectra of ASK- FSK- PSK – DPSK – QAM - QPSK and MSK Schemes – Comparison of Digital Modulation Systems using a Single Carrier – Carrier and Symbol Synchronization – Applications of QAM.

Unit IV ERROR CONTROL CODING 9

Linear Block Codes – Cyclic Codes – Generator Polynomial – Encoder for Cyclic Codes – Convolutional Codes – Time Domain and Transform Domain Approach – Maximum Likelihood Decoding of Convolutional Codes – Viterbi Algorithm

Unit V SPREAD SPECTRUM MODULATION 9

Pseudo- Noise Sequences – Properties of Maximum Length Sequence – Direct Sequence Spread Spectrum with Coherent BPSK– Processing Gain –Probability of Error – Jamming Margin – Frequency – Hop Spread Spectrum.

TOTAL : 45 HOURS

Text Book

1) Simon Haykin, "Digital Communications", Wiley India Pvt.Ltd, 2015
2) John G. Proakis, "Digital Communication" 5th Edition, McGraw Hill, 2014

References

1) B. P. Lathi, Zhi Ding, 'Modern Digital and Analog Communication Systems", Oxford University Press, 2017
2) Taub and Schilling, "Principles of Digital Communication", 4 th edition, Tata McGraw-Hill, 2013
3) Sanjay Sharma," Digital Communication," 6th edition, S.K.Kataria & son's publication, 2014.
4) Sklar Bernard, "Digital Communications — Fundamentals and Applications", Pearson Education-LPE, 2nd Ed., 2009

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Course Outcomes

After successful completion of this course, the students should be able to

1) Design HDL code for combinational circuits and sequential circuits
2) Analyze MOS and CMOS transistor characteristics
3) Illustrate the fabrication processes of CMOS & logic families
4) Architectural choices and performance tradeoffs involved in designing
5) Learn the different FPGA architectures and testability of VLSI circuits

Pre-requisite

Digital Electronics

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	3	2	3	3	1	1	2	1	3	3
CO2	1	2	2	2	2	1	2	3	1	1	2	1	2	3
CO3	2	2	3	3	2	1	2	2	1	2	1	1	3	3
CO4	2	2	2	3	2	3	2	3	1	2	2	1	3	3
CO5	1	2	3	3	2	3	3	2	1	2	1	2	2	2

Unit I VERILOG HDL 9

Overview of Digital Design with Verilog HDL, Hierarchical Modeling Concepts, Basic Concepts, Modules and Ports, Gate-Level Modeling, Dataflow Modeling, Behavioral Modeling, Tasks and Functions, Logic Synthesis with Verilog.

Unit II MOS TRANSISTOR THEORY 9

Introduction – MOS Transistors – CMOS Logic – Inverter – NAND gate – CMOS Logic Gates = Compound = MOS Transistor Theory = MOS Structure = nMOS and pMOS Transistor Operation –Long Channel V-I Characteristics – C-V Characteristics – Non-ideal I-V Effects – DC Transfer Characteristics CMOS Inverter.

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Unit III **CMOS TECHNOLOGY AND LOGIC FAMILY** **9**

Introduction – CMOS Technologies – nMOS Fabrication – n-well Process – SOI – Twin Well Process - Layout Design Rules – CMOS Process Enhancement - Stick Diagram – Inverter – CMOS NAND – CMOS NOR. Static CMOS – Pseudo logic– Dynamic Circuits – Pass-Transistor Circuits – CMOS with Transmission Gates – Source of Power Dissipation

Unit IV **DESIGNING ARITHMETIC BUILDING BLOCKS** **9**

Data path circuits, architectures for ripple carry adders (RCA), high speed adders, carry look ahead adder (CLA), Accumulators, Multipliers, Barrel shifters, Speed and Area tradeoff..

Unit V **TESTING OF VLSI CIRCUITS** **9**

Introduction – Testers – Text Fixtures and Test Programs – Logic Verification Principles - Silicon Debug Principles – Manufacturing Test – Design for Testability – Boundary Scan

TOTAL : 45 HOURS

Text Book

1) Neil H. E Weste and David Money Harris, "CMOS VLSI Design a circuits and systems perspective", 4th Edition, Pearson, 2015..
2) Ciletti, "Advanced Digital Design with the Verilog HDL, 2nd Edition ", Pearson Education, Second Edition, 2011

References

1) Jan M. Rabaey, Anantha Chandrakasan ,Borivoje Nikolic, "Digital Integrated Circuits a design perspective", Pearson Education, 2nd edition, 2016
2) Charles H. Roth, Jr., Lizy Kurian John,"Digital System Design using VHDL", Cengage, 3rd edition, 2018
3) Pucknell D.A and Eshraghian K., "Basic VLSI Design", Third Edition, PHI, 2003.

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Week 1 : Overview of Object-Oriented Programming and Java

Week 2 : Java Programming Elements

Week 3 : Input-Output Handling in Java

Week 4 : Encapsulation

Week 5 : Inheritance

Week 6 : Exception Handling

Week 7 : Multithreaded Programming

Week 8 : Java Applets and Servlets

Week 9 : Java Swing and Abstract Windowing Toolkit (AWT)

Week 10 : Networking with Java

Week 11 : Java Object Database Connectivity (ODBC)

Week 12 : Interface and Packages for Software Development

Books and references

1) Java: The Complete Reference Hebert Schildt, Mc Graw Hill

2) Object-Oriented Programming with C++ and Java Debasis Samanta, Prentice Hall India

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Week 1	:	Introduction to IoT: Part I, Part II, Sensing, Actuation, Basics of Networking: Part-I
Week 2	:	Basics of Networking: Part-II, Part III, Part IV, Communication Protocols: Part I, Part II
Week 3	:	Communication Protocols: Part III, Part IV, Part V, Sensor Networks: Part I, Part II
Week 4	:	Sensor Networks: Part III, Part IV, Part V, Part VI, Machine-to-Machine Communications
Week 5	:	Interoperability in IoT, Introduction to Arduino Programming: Part I, Part II, Integration of Sensors and Actuators with Arduino: Part I, Part II
Week 6	:	Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi
Week 7	:	Implementation of IoT with Raspberry Pi (contd), Introduction to SDN, SDN for IoT
Week 8	:	SDN for IoT (contd), Data Handling and Analytics, Cloud Computing
Week 9	:	Cloud Computing(contd), Sensor-Cloud
Week 10	:	Fog Computing, Smart Cities and Smart Homes
Week 11	:	Connected Vehicles, Smart Grid, Industrial IoT
Week 12	:	Industrial IoT (contd), Case Study: Agriculture, Healthcare, Activity Monitoring

Books and References

1) S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press. Availability: https://www.amazon.in/Introduction-IoT-Sudip-Misra/dp/1108959741/ref=sr_1_1?dchild=1&keywords=sudip+misra&qid=1627359928&sr=8-1
2) S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
3) Availability : https://www.amazon.in/dp/1032146753/ref=sr_13?dchild=1&keywords=sudip+misra&qid=1627359971&sr=8-3
4) Research Papers

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U19EC506 **MICROPROCESSORS AND MICROCONTROLLER LABORATORY** 0 0 2 1

Course Outcomes

After successful completion of this course, the students should be able to

1) Write the assembly language programs to perform various arithmetic and logical operations using microprocessors.
2) Interface various peripheral ICs' and I/O devices with 8086 microprocessor.
3) Write the assembly language programs to generate time delay and to establish the data communications using 8051 microcontroller

Pre-requisite

Basics of Microprocessor and Microcontroller

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

List of Experiments

1) Study of 8085, 8086 and 8051 Trainer Kits
2) 8- bit Addition and Subtraction using 8085µP
3) 16-bit Manipulation (addition and subtraction) 8085µP.
4) 8-bit Multiplication and Division 8085µP
5) 16-bit Multiplication and Division 8085µP
6) Code Conversion 8085µP
7) 16 – bit Addition and Subtraction using 8086µP
8) 16 - bit Multiplication and Division using 8086µP
9) String Manipulation using 8086µP
10) Array Manipulation using 8086µP
11) Experiments with 8255 in Mode 0 using 8086µP

05.07.2023

05/07/23
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Regulations- 2019

12) 8279 Keyboard/Display Interface with the 8086μP
13) Timer Interface 8253 with the 8086μP
14) Stepper Motor Interface 8086μP
15) 8-bit Manipulations using 8051 Microcontroller
16) 16-bit Manipulations using 8051 Microcontroller
17) Array Operations-Sum of N Elements using 8051 Microcontroller
18) Generation of Time Delay using 8051 Microcontroller
19) Data Communications using Parallel and Serial Ports

05/07/23

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Total: 30 Hours

U19EC507 COMMUNICATION SYSTEMS LABORATORY 0 0 2 1

Course Outcomes

After successful completion of this course, the students should be able to

1) Design and construct signal generator and demodulator for AM and FM
2) Construct the sampling process of a signal and its recovery using the sampled version
3) Generate and detect the signals using analog and digital pulse modulation techniques

Pre-requisite

Signals and systems, Digital Signal Processing

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

List of Experiments

1) Amplitude Modulation and Demodulation
2) Frequency Modulation and Demodulation
3) Characteristics of AM Receiver (Selectivity and Sensitivity)
4) Sampling of an Analog Signal and Reconstruction
5) Pulse Modulation Techniques - PAM, PWM, PPM
6) Study of Line Coding Formats and Decoding
7) Time Division Multiplexing using PAM
8) Pulse Code Modulation
9) Delta Modulation and Demodulation
10) Differential Pulse Code Modulation
11) Digital Modulation -ASK, FSK, PSK, QPSK
12) Analysis of Filters using Network Analyzer

05.07.2023

05/07/25
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TOTAL : 30 HOURS

Regulations- 2019

Course Outcomes

After successful completion of this course, the students should be able to

1) Design and simulate the combinational logic circuits and sequential logic circuits using Verilog HDL
2) Design CMOS circuit using SPICE
3) Implement in Artix FPGA

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

List of Experiments

Design and simulate the combinational logic circuits and sequential logic circuits using Verilog HDL.

1) Adder and Subtractor
2) Multiplexer, Demultiplexer, Encoder and Decoder
3) Comparator
4) Flipflops
5) Synchronous counter and ripple counter
6) Shift register
7) Sequence detector using FSM

Design CMOS circuit using SPICE

8) CMOS Inverter
9) Logic gates, Boolean Expression

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Implement in Artix FPGA

10) 4 – bit adder
11) 4 – bit multiplier
12) Traffic light controller
13) Bluetooth interface
14) Wi – Fi interface
15) Image Capture

TOTAL: 30 HOURS

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U19GE501 SOFT SKILLS AND APTITUDE - III 0 0 2 1

Course Outcomes

After successful completion of this course, the students should be able to

1) Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches
2) Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3) Demonstrate greater than SSA-II level of verbal aptitude skills in English with regard to given topics and score 70-75% marks in company-specific internal tests

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	1	1	3	3	3	3	1	1	3	1	1
CO2	3	3	1	1	2	3	2	2	3	2	2	3	3	3
CO3	1	2	1	2	1	1	1	1	3	3	1	3	1	2

List of Experiments

1) **SOFT SKILLS**

Demonstrating Soft-Skill Capabilities With Reference to the following topics:

a) **Career planning:** Importance; Exploring various career options, Field research, Social media management; Process, benefits and limitations of career planning; Mapping SWOT and GOALS to career planning; Self-evaluation.
b) **Resume writing:** Build credentials and resume, Positioning yourself and your career, JD mapping, Video resume, Relevant resume phrases and components; Cover letter; Portfolio management and Social media cover.
c) **Group discussion:** Skills needed for GD; Frequently Asked topics and Practice; Types of topics; Various framework and tools to handle GD; Practice and assessment.
d) **Teamwork:** Definition and importance of team-building; Stages of team-building; Communication within a team; Various styles of teams and their analysis; Activities demonstrating a team
e) **Leadership skills:** Role of a leader; Difference between a manager and a leader; Various Leadership styles; Compelling qualities of a leader; Famous leaders and their impact to the world; Self-assessment.

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f) **Interview skills:** Process and types of interview; Appearance and grooming etiquette; Do's and Don'ts (Before – During interview); Brainstorming interview possible questions; Hot seat; Transactional Analysis for effective communication and handling interviewers; mock interviews and assessment parameters discussion
g) **Mock interviews:** Frequently Asked Questions practice and assessment; Discussion and demonstrations on Stress and Technical interviews; Group interview
h) **Mock GDs:** Frequently Asked Topics Practice; Assessment and feedback

2) **QUANTITATIVE APTITUDE AND LOGICAL REASONING**

Solving problems with reference to the following topics

a) **Geometry**: 2D, 3D, Coordinate Geometry, and Height & Distance
b) **Permutation & Combinations**: Principles of counting, Circular Arrangements and Derangements.
c) **Probability**: Addition & Multiplication Theorems, Conditional Probability and Bayes Theorem.
d) **Statistics**: Mean Median, Mode, Range and Standard Deviation
e) **Interest Calculation**: Simple Interest and Compound Interest
f) **Crypto arithmetic**: Addition and Multiplication based problem
g) **Logical Reasoning**: Blood Relations, Directions Test, Series, Odd man out, Analogy, Coding & Decoding, Problems and Input – Output Reasoning
h) Statement & Assumptions, Statements & Arguments, Inference
i) **Company Specific Pattern**: Infosys and TCS company specific problems

3) **VERBAL APTITUDE**

Demonstrating English language skills with reference to the following topics:

a) Subject verb agreement
b) Selecting the best alternative for the stated parts of given sentences.
c) Reading comprehension
d) Contextual synonyms
e) Sentence fillers
f) Writing a story for a given picture
g) Company specific aptitude questions

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TOTAL: 30 HOURS

V Sem

Semester –V	U19GE501 : SOFT SKILLS AND APTITUDE - III	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

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

1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches
2. Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3. Display effective language knowledge to construct sentences with subject verb agreement and select the best alternative for the underlined parts of the sentences, and fill in the blanks in the given passages with suitable forms of words and their synonyms.

1.SOFT SKILLS	**Demonstrating soft-skill capabilities with reference to the following topics:** a. Career planning b. Resume writing c. Group discussion d. Teamwork e. Leadership skills f. Interview skills g. Mock interviews h. Mock GDs
2.QUANTITATIVE APTITUDE AND LOGICAL REASONING	**Solving problems with reference to the following topics :** a. **Geometry:** 2D, 3D, Coordinate Geometry, and Height & Distance. b. **Permutation&Combinations:**Principles of counting, Circular Arrangements and Derangements. c. **Probability:** Addition & Multiplication Theorems, Conditional Probability and Bayes Theorem. d. **Statistics** : Mean Median, Mode, Range and Standard Deviation. e. **Interest Calculation** :Simple Interest and Compound Interest f. **Crypto arithmetic:** Addition and Multiplication based problem. g. **Logical Reasoning** :Blood Relations, Directions Test, Series, Odd man out, Analogy, Coding & Decoding, Problems and Input – Output Reasoning. h. Statement & Assumptions, Statements & Arguments, Inference. i. **Company Specific Pattern** :Infosys and TCS company specific problems
3. VERBAL APTITUDE	**Demonstrating English language skills with reference to the following topics:** a. Subject verb agreement b. Selecting the best alternative for the stated parts of given sentences c. Reading comprehension d. Contextual synonyms e. Sentence fillers f. Writing a story for a given picture g. Company specific aptitude questions

S. Anit 31/07/2023.

Dr.S.Anita

Head/Training

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Syllabi for

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

B.E/B.Tech Honours

B.E/B.Tech Minor

courses

ECE (MONS)

U19EC2035 VERILOG HDL 2 0 2 3

Course Outcomes

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

1) Understand the concept of verilog.
2) Design a RTL using dataflow modeling
3) Design a RTL using behavioral modeling
4) Design a RTL using structural modeling
5) Design Verilog test benches for combinational as well as sequential Digital Circuits.

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

Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	3	-	-	-	1	3	3	3
CO2	3	3	3	3	3	2	3	2	1	-	1	3	3	3
CO3	3	3	3	3	3	2	3	2	1	-	1	3	3	3
CO4	3	3	3	3	3	2	3	2	1	-	1	3	3	3
CO5	3	2	3	3	3	2	3	2	1	-	1	3	3	3

Unit I INTRODUCTION TO VERILOG 6

Importance of HDL - Design Methodologies - Basic Concepts - Lexical Conventions Data Types - Verilog Operators - Modules and Ports - Switch level modeling

Unit II DATAFLOW MODELING 6

User Defined Primitives (UDP) – Dataflow modeling - Design examples using Combinational and Sequential Logic.

Unit III BEHAVIORAL MODELING 6

Procedural Constructs - Timing controls – Block Statement – Procedural assignments – conditional statement – case statement – loop statement - Design examples using Combinational and Sequential Logic.

Unit IV STRUCTURAL MODELING 6

Module Instantiation - Design examples using Combinational and Sequential Logic – Tasks – Functions.

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Unit V VERILOG TEST BENCHES 6

Timing and Delays- Inter & Intra segment delay - System Tasks - Event Scheduler- Compiler Directives-Verilog Test Benches for Combinational Logic Modules and Sequential Digital Circuits - Verification of Memory - AMBA, APB protocol based verification

Theory: 30 Hrs. Practical: 30 Hrs. TOTAL: 60 Hrs.

List of Experiments:

1. Write Verilog code for full using user defined primitives.
2. Write Verilog code for 2 x1 using user defined primitives.
3. UDF description of a 3 bit majority circuit, the output is 1 if the input vector has two or more 1's.
4. Design and implementation Encoder and decoder using data flow modeling
5. Design and implementation of latch using data flow modeling.
6. Design and implementation of multiplexer and demultiplexer using behavioral modeling
7. Design and implementation of flip flops using behavioral modeling.
8. Design and implementation of full adder using half adder using structural modeling
9. Design and implementation of master slave flip flop using structural modeling,
10. write the test bench code for full adder circuits.
11. write the test bench code for jk flip flop circuits.

Text Books

1) M. Morris Mano and Michael D. Ciletti – 'Digital Design with an Introduction to the Verilog HDL', 6th Edition, Pearson Education, 2018
2) J. Bhasker "A Verilog HDL Primer, Third Edition", 3th Edition, Star Galaxy Publishing, 2018.

References

1) Charles Roth, Lizy Kurian John , Byeong Kil Lee. "Digital Systems Design Using Verilog", Cengage learning , 2017.
2) B.Bala Tripura Sundari T.R. Padmanabhan, "Design through Verilog HDL" , Wiley, 2008.

Honor ECE

U19EC2037 **TESTING OF VLSI CIRCUITS** 3 0 0 3

Course Outcomes

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

1) Describe the testing and fault modeling.
2) Explain test generation for combinational and sequential circuits.
3) Analyze the design for testability methods.
4) Develop self-test and test algorithms.
5) Analyze the fault diagnosis for combinational circuits.

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

Unit I BASICS OF TESTING AND FAULT MODELING 9

Introduction to Testing - Faults in digital circuits - Modeling of faults - Logical Fault Models - Fault detection - Fault location - Fault dominance - Logic Simulation - Types of simulation - Delay models - Gate level Event-driven simulation.

Unit II TEST GENERATION FOR COMBINATIONAL AND SEQUENTIAL CIRCUITS 9

Test generation for combinational logic circuits - Testable combinational logic circuit design - Test generation for sequential circuits - Design of testable sequential circuits.

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Unit III DESIGN FOR TESTABILITY 9

Design for Testability - Ad-hoc design - Generic scan based design - Classical scan based design – System level DFT approaches.

Unit IV SELF TEST AND TEST ALGORITHMS 9

Built-In Self Test - Test pattern generation for BIST - Circular BIST - BIST Architectures - Testable Memory Design - Test algorithms - Test generation for Embedded RAMs.

Unit V FAULT DIAGNOSIS 9

Logic Level Diagnosis - Diagnosis by UUT reduction - Fault Diagnosis for Combinational Circuits - Self-checking design - System Level Diagnosis.

TOTAL : 45 HOURS

Text Books

1) P.K. Lala, "Digital Circuit Testing and Testability", Academic Press, 2002.
2) M. Abramovici, M.A. Breuer and A.D. Friedman, "Digital Systems and Testable Design", Jaico Publishing House, 2001.

References

1) M.L. Bushnell, V. D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits" Kluwer Academic Publishers, 2009.
2) S. Mourad, and Y. Zorian,"Principles of Testing Electronic Systems", John Wiley & Sons, 2000.

Minor

I AIDS

U19ADS2035 **PYTHON FOR DATA SCIENCE** **3 0 2 4**

COURSE OUTCOME:

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

1. Learn the foundations of data science and the primary areas of this discipline's research.
2. Demonstrate skill in Python sequence data structures, including strings, arrays, lists, tuples, sets, and dictionaries.
3. Apply aggregation functions such as finding the minimum, maximum, and mean values of arrays.
4. Apply various operations and transformations on data using Pandas methods and functions.
5. Analyse the need for data pre-processing and Web scrapping techniques.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2								2	2	1	1	1
CO2	3	2	1							2	1	2	2	2
CO3	3	3	1	1	1						1		2	3
CO4	3	3	2	2	2						1		3	2
CO5	3	3	2	3	3						2	2	2	3

UNIT I INTRODUCTION DATA SCIENCE AND PYTHON **9**

What is data? what is data science? - Fundamentals of data science - Data science life cycle - Why data science is important? - Applications of data science -Basics of data: categories of data- Sources of data- data processing -Why Python is necessary for data science? - Jupyter/pycharm/spyder or any other python tool set up and installation.

UNIT II BASICS OF PYTHON AND DATA STRUCTURES **9**

Data types - operators – variables – expressions - control structures using sample dataset-objects and functions -Python sequence data structures including String, Array, List, Tuple, Set, and Dictionary.

UNIT III INTRODUCTION TO NUMPY **9**

Understanding Data Types in Python -The Basics of NumPy Arrays-Computation on NumPy Arrays: Universal Functions -Aggregations: Min, Max, and Everything In Between - Computation on Arrays: Broadcasting -Comparisons, Masks, and Boolean Logic- Fancy Indexing -Sorting Arrays-Structured Data: NumPy's Structured Arrays

UNIT IV DATA MANIPULATION WITH PANDAS **10**

Introducing Pandas Objects - Data Indexing and Selection - Operating on Data in Pandas - Handling Missing Data - Hierarchical Indexing -Combining Datasets: Concat and Append - Combining Datasets: Merge and Join- Aggregation and Grouping - Pivot Tables - Vectorized String Operations - Working with Time Series -High-Performance Pandas: eval () and query()

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UNIT V EXPLORATORY DATA ANALYSIS 8

Data pre-processing: data loading - dealing with missing values and outliers - data wrangling - filtering data - Data Normalization - Data Formatting -data cleaning - Web scraping with beautiful soup.

THEORY – 45 HRS **PRACTIAL: 30 HRS** **TOTAL: 75 HOURS**

LAB EXERCISES:

1. Write a python program to perform following operations.
   a. Create a list, insert elements into the list and sort it in ascending order.
   b. Create a dictionary of 10elements, change/delete the values of few keys and display the dictionary before and after the updates.
   c. Create a tuple and a list. Convert the list to tuple and display the elements of both. Write the program to remove the duplicate element of the list.

2. Write a python program to perform following task using NumPy
   a. Develop a program to learn concept of array and NumPy module.
   b. Convert a list of numeric value into a one-dimensional NumPy array. And perform all operations on that array.
   c. Find the union of two arrays. Union will return the unique, sorted array of values that are in either of the two input arrays.

3. Perform the following task using pandas
   a. Convert a NumPy array to a Pandas series. Also write a Pandas program to calculate the frequency counts of each unique value of a given series.
   b. Read a dataset from diamonds DataFrame and modify the default columns values and print the first 6 rows. Also find the number of rows and columns and data type of each column of diamonds DataFrame.
4. Write a program to perform all basic data pre-processing steps on the given data set.
5. Write a program to perform exploratory data analysis on the given dataset.

TEXTBOOKS:

1. Python for data science for dummies 2nd Edition, John Paul Mueller, Luca Massaron, and Wiley.(Unit- 1,4,5)
2. Vasiliev, Y. (2022). Python for Data Science: A Hands-On Introduction. United Kingdom: No Starch Press. (Unit- 1,3,4)
3. Thareja, R. (2019). Python Programming: Using Problem Solving Approach. India: Oxford University Press. (Unit- 2)

REFERENCE BOOKS:

1. Pandas for everyone: Python Data Analysis, Daniel Y. Chen, Pearson
2. Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Davy Cielen, Arno D.B. Meysman, et al., Minning
3. Applied Data Science with Python and Jupyter: Use powerful industry-standard tools to unlock new, actionable insights from your data.

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minor

U19ADS2036 INTRODUCTION TO DATA SCIENCE 3 0 0 3

COURSE OUTCOMES

At the end of the course, student will able to

1. Explain the life cycle of data analytics project
2. Apply Exploratory Data Analysis over the dataset
3. Explore data pre-processing and feature selection techniques over a dataset
4. Apply association rule mining to find the frequent item set in business data repository
5. Build different type of regression models for different business use cases

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2				2	2				2
CO2	3	2	2	2	2									3
CO3	3	2	2	2	2									3
CO4	3	3	3	3	3								2	3
CO5	3	3	3	3	3								2	3

UNIT I INTRODUCTION 9

Need for data science – benefits and uses – facets of data – Data Analytics Lifecycle: Data Analytics Lifecycle Overview - Discovery – Data Preparation – Model Planning –Model Building – Communicate Results

UNIT II EXPLORATORY DATA ANALYTICS 9

Exploratory Data Analysis: Visualization before Analysis, Dirty Data, Examining Single and Multiple Variable, Data Exploration- Statistical Methods for Evaluation: Hypothesis Testing, Difference of Means, Wilcoxon Rank-Sum Test, Type I and Type II errors, Powers and Sample Size, ANOVA

UNIT III DATA PRE-PROCESSING AND FEATURE SELECTION 9

Data cleaning - Data integration - Data Reduction - Data Transformation and Data Discretization, Feature Generation and Feature Selection, Feature Selection algorithms: Filters-Wrappers, and Embedded

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UNIT IV DATA ANALYTICS METHOD – ASSOCIATION RULE MINING 9

Association Rules: Apriori Algorithm, Evaluation of Candidate rules, Application of Association Rules, Frequent Pattern Growth Algorithm, Validation and Testing, Rule based Classifiers – Use case: Grocery Stores, Recommendation System

UNIT V REGRESSION MODELS 9

Regression Models – Use of Regression Analysis – Types of Regressions: Linear Regression, Logistic Regression, Polynomial Regression, Stepwise Regression, Ridge Regression, Lasso Regression, and ElasticNet Regression- Selection of Right Regression Model –Use Case: Sales Forecasting, Credit Card industry

TOTAL: 45 HOURS

TEXT BOOKS

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics: Discovering, Analysing, Visualizing, and Presenting Data ", Wiely 2015

REFERENCES

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
2. Jiawei Han, Micheline Kamber and Jian Pei ,"Data Mining: Concepts and Techniques", 3rd Edition , Morgan Kaufmann,2011
3. Jay Liebowitz, "Big Data and Business Analytics", CRC Press, 2013
4. Cathy O'Neil and Rachel Schutt, "Doing Data Science". O'Reilly, 2014.

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Minor

U19CS2048 **CRYPTOGRAPHY ESSENTIALS** **3 0 0 3**

COURSE OUTCOMES

At the end of the course, student will able to

- Describe various types of attacks with their characteristics and apply classical encryption algorithms to encrypt the data.
- Apply the different symmetric cryptographic algorithms for encryption and decryption.
- Apply the different public key cryptography algorithms for encryption and decryption.
- Compare the various message authentication schemes.
- Analyze the different system security mechanisms and algorithms that are specific to some particular applications like email, user authentication, key exchange and message integrity.

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

UNIT I INTRODUCTION 9

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT II SYMMETRIC KEY CRYPTOGRAPHY 9

Mathematics Of Symmetric Key Cryptography: Algebraic structures – Modular arithmetic-Euclid's algorithm- Congruence - SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

Mathematics of Asymmetric Key Cryptography: Primes – Primality Testing –Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Asymmetric Key Ciphers: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange.

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature – DSS- Entity Authentication applications - Kerberos, X.509.

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security – PGP, S/MIME – IP security – Web Security – System Security: Firewalls -Recent trends in cryptography.

TEXT BOOK:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", PHI 3rd Edition, 2006.

TOTAL: 45 H

REFERENCES:

1. C K Shyamala, N Harini and Dr. T R Padmanabhan,"Cryptography and Network Security", Wiley India Pvt.Ltd, 2011
2. BehrouzA.Foruzan, "Cryptography and Network Security", Tata McGraw Hill 2007.
3. Charlie Kaufman, Radia Perlman, and Mike Speciner," Network Security: Private Communication in a Public World", Prentice Hall, 2002

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Minor CSE

U19CS2047 DATA COMMUNICATIONS AND NETWORKING 3 0 0 3

Course Outcomes:

At the end of the course, student will able to

- Comprehend the Categories and functions of various Data communication Networks.
- Analyze various error detection techniques in the data link layer.
- Demonstrate the mechanism of routing the data in network layer.
- Compare the various Flow control and Congestion control Mechanisms.
- Analyze the Functioning of various Application layer Protocols.

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

UNIT I Introduction to Data Communications **9**

Components, Data Representation, Data Flow, Networks- Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite

UNIT II Data Link Layer **9**

Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame.

UNIT III The Network Layer 9

Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet-Datagram format, IPv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

UNIT IV Transport Layer 9

Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go- Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control.

UNIT V Application Layer 9

Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

TOTAL: 45 H

TEXT BOOK:

1. Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education, 2007

REFERENCES:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson,2017.
2. Bhusan Trivedi , Data communication and Networks -, Oxford university press, 2016
3. Andrew S Tanenbaum ,Computer Networks, 4th Edition, Pearson Education, 2003
4. Shay W.A, Understanding Communications and Networks, 3rd Edition, , Cengage Learning, 2008

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ECE
VI

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

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1.	U19EC601	Antenna and Wave Propagation		3	0	0	3	45
2.	U19EC602	Digital Image Processing		3	0	0	3	45
3.	U19EC603	Embedded Systems		3	0	0	3	45
4.	U19EC901	Professional Elective	FPGA Based System Design (Lab Integrated)	2	0	2	3*	60
	U19EC904		Machine learning (Lab Integrated)					
5.	U19EC912	Professional Elective	Smart sensors for wearable applications	3	0	0	3**	45
	U19EC913		Computer Networks					
	U19EC928		IoT and Sensors					
6.	U19BM1001	Open Elective - I	Hospital Management	3	0	0	3#	45
	U19CE1002		Municipal Solid Waste Management					
	U19CS1001		Big Data Analytics					
	U19CS1002		Cloud Computing					
	U19EE1001		Electric Mobility					
	U19EE1002		Energy Conservation and Management					
	U19EE1003		Innovation, IPR and Entrepreneurship Development					
	U19EE1004		Renewable Energy Systems					
	U19FT1001		Fundamentals of Fashion Design					
	U19FT1002		Garment Manufacturing Technology					
	U19IT1004		Introduction to Database Technology					
	U19MC1004		Fundamentals of Robotics					
	U19ME1004		Renewable Energy Sources					

Practical							
7	U19EC604	Digital Image Processing laboratory	0	0	2	1	30
8	U19EC605	Embedded Systems laboratory	0	0	2	1	30
9	U19EC606	Mini Project	0	0	2	1	30
10	U19GE601	Soft Skills and Aptitude - IV	0	0	2	1	30
Total Credits						**22**	**405**

***Any 1 elective to be opted by a student among 2 professional electives**

****Any 1 elective to be opted by a student among 3 professional electives**

 # Any 1 elective to be opted by a student among 13 open electives

Approved By 22/12/2023

Chairperson, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar 26/12/23

28/12/23
Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electronics and Communication Engineering, Sixth Semester BE ECE Students and Staff, COE

U19EC601 **ANTENNA AND WAVE PROPAGATION** 3 0 0 3

Course Outcomes

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

1) Analyze the antenna fundamentals and Radiation pattern
2) Evaluate the different parameters of antenna arrays.
3) Design microwave antennas for the given specifications
4) Analyze the different measurement techniques of antenna parameters and special antennas
5) Analyze the atmospheric and terrestrial effects on radio wave propagation.

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

Unit I **ANTENNA FUNDAMENTALS** **9**

Basic antenna parameters - Reciprocity principle - Friis transmission formula - Retarded vector potential - Power radiated and radiation resistance of current element - Radiation from half - wave dipole antennas - folded dipole - Loop antenna

Unit II **ANTENNA ARRAYS** **9**

Antenna Arrays- Broad-side array - End-Fire array - Collinear array and Parasitic array - Arrays of point sources - Two point sources – Linear array with n point sources (broad side and end fire case) - Pattern multiplication - Binomial array - Chebyshev array - Taylor series.

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Unit III MICROWAVE ANTENNAS 9

Helical antenna - Normal mode and axial mode operation -Yagi Uda Antenna - Log periodic antenna - Spiral antenna - Rhombic antenna - Horn antenna – Antennas with parabolic reflectors – Case study of Micro strip antenna – Implementation of Micro strip antenna in HFSS.

Unit IV ANTENNA MEASUREMENTS AND SPECIAL ANTENNAS 9

Measurement of different Antenna parameters - Radiation pattern – Gain – Phase – Polarization – Impedance – Efficiency - Antennas for special applications- Antenna on cellular handsets - GPR - Embedded antennas - UWB - Plasma antenna.

Unit V RADIO WAVE PROPAGATION 9

Ground wave propagation - Calculation of field strength at a distance - Space wave propagation - Duct propagation – Calculation of field strength at a distance - Sky wave propagation - Structure of the ionosphere - Mechanism of refraction - Refractive index - Critical frequency - Skip distance - Maximum usable frequency - Calculation of field strength at a distance - Fading and Diversity reception.

TOTAL : 45 HOURS

Text Books

1) John D. Kraus and Ronald Marhefka, "*Antennas*", Tata McGraw-Hill Book Company, Reprint 2017
2) C.A.Ballanis, "*Antenna Theory Analysis and Design*", Wiley inter science, Reprint 2016

References

1) Prasad K.D., "*Antennas and Wave Propagation*", Satya Prakashan, Reprint 2018
2) Jordan E.C and Balmain, "*Electro Magnetic Waves and Radiating Systems*", PHI, Reprint 2015..
3) Collins R.E., "*Antennas and Radio Propagation*", McGraw-Hill, Reprint 2014.

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U19EC602 **DIGITAL IMAGE PROCESSING** 3 0 0 3

Course Outcomes

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

1) Describe the fundamentals of monochrome and color image processing and analyze the basic relations between pixels, connectivity and distance measures
2) Apply DFT DCT, DST, Walsh, Hadamard, Haar, wavelet and SVD transform for images
3) Apply image enhancement techniques in spatial and frequency domain
4) Analyze image restoration using constrained and unconstrained filters and image segmentation approaches
5) Appraise the need for image compression using lossy and lossless techniques and Morphological operations

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	1	1	1	1	2	2	2	3	3
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CO3	3	3	2	2	3	1	1	1	1	2	2	2	3	3
CO4	3	3	2	2	3	1	1	1	1	2	2	2	3	3
CO5	3	3	2	2	3	1	1	1	1	2	2	2	3	3

Unit I DIGITAL IMAGE FUNDAMENTALS 9

Fundamental Steps in Digital Image Processing – Elements of Visual Perception – Some Basic Relationship Between Pixels – Connectivity – Distance Measure – Brightness – Contrast – Hue- Saturation – Mach Band Effect – Image Sampling – Quantization – Dither – Colour Image Fundamentals RGB – HSI Models – Conversion from RGB to HSI.

Unit II IMAGE TRANSFORMS 9

2D Transforms : DFT – DCT – DST – Walsh – Hadamard – Haar Transform –SVD- Discrete Wavelet Transform – Multi Resolution Analysis

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Unit III IMAGE ENHANCEMENT 9

Spatial Domain Approach – Point Processing – Image Negative – Contrast Stretching – Gray Level Slicing – Histogram Equalization – Image Addition – Subtraction – Averaging – Smoothing Filters – Spatial LPF – Median Filter – Sharpening Filters – Spatial HPF – High Boost Filter – Derivative Filters Frequency Domain Filters – Homomorphic Filter.

Unit IV IMAGE RESTORATION AND SEGMENTATION 9

Degradation Model – Noise Models – Types of Restoration – Inverse Filtering – Least Mean Square (wiener–parametric wiener) Filter – Image Segmentation – Point – Line and Edge Detection – Region Based Segmentation – Region Splitting and Merging – Thresholding. Standard Binary Morphological Operations-Dilation and Erosion based Operations.

Unit V IMAGE COMPRESSION 9

Image Compression – Lossless Compression – Huffman Coding – Minimum Variance Huffman Coding – Arithmetic Coding – LZW Coding – Lossy Compression – Transform Coding – Compression Standards – JPEG Image Compression Standards – MPEG Video Compression Standards-Block Diagram Approach

TOTAL : 45 HOURS

Text Book

1) Jayaraman S., Esakkirajan and Verrakumar, "Digital Image Processing", TMH New Delhi, 2nd edition ,2020.
2) Rafael C- Gonzalez- Richard E-Woods, "Digital Image Processing", Pearson Education, Eleventh Impression, 2013

References

1) Annadurai S., R. Shanmugalakshmi, "Fundamentals of Digital Image Processing", Pearson Education India,2007
2) Anil K- Jain, "Fundamentals of Digital Image Processing", Pearson/Prentice Hall of India, 2002
3) Sridhar.S, "Digital Image Processing", Oxford University Press, First Edition, 2011
4) Sabeenian R.S., "Digital Image Processing", Sonaversity publication, Second Edition reprint, 2014.
5) Kenneth R. Castleman, "Digital Image Processing", Pearson, 2009.Samuel Y- Liao, *"Microwave Devices and Circuits"*, Pearson/Prentice Hall of India, 3rd Edition 2011.

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U19EC603 **EMBEDDED SYSTEMS** 3 0 0 3

Course Outcomes

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

1) Understand the hardware and software architecture of embedded system
2) Analyze the factors on developing the embedded software..
3) Develop the embedded hardware using ARM processor..
4) Design the embedded software using real time operating system tools
5) Develop the embedded applications using suitable hardware and software.

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

Unit I ARCHITECTURE OF EMBEDDED SYSTEMS 9

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

Unit II DESIGN AND ANALYSIS OF EMBEDDED SYSTEMS 9

Embedded System Design Process – Formalism for System Design – Memory System Mechanism – CPU Performance – CPU Power Consumption – CPU Buses – Memory Devices – I/O Devices – Program Design – Model of Programs – Analysis and Optimization of Execution Time – Power – Energy – Program Size – Program Validation and Testing.

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Unit III ARM PROCESSOR 9

The ARM architecture basics – Architectural inheritance – The ARM programmer model- 3 stage and 5 stage pipelining – ARM organization –Addressing modes – ARM instruction set (Data processing, Data transfer, Branching) – Thumb Instructions set.

Unit IV REAL-TIME OPERATING SYSTEM CONCEPTS 9

Architecture of the Kernel – Task and Task Scheduler – Interrupt Service Routines – Semaphores – Mutex – Mailboxes – Message – Queues – Event Registers – Pipes – Signals – Timers – Memory Management – Priority Inversion Problem.

Unit V DEVELOPMENT OF EMBEDDED APLPLICATIONS 9

Case Study of an Automatic Chocolate Vending Machine using MUCOS RTOS – Case Study on developing digital camera– Case Study on developing adaptive crucial system.

TOTAL : 45 HOURS

Text Book

1) Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 4th Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2016.
2) Raj Kamal "Embedded Systems Architecture Programming and Design" 3rd Edition TMH, 2014.
3) Steve Furber, "ARM System on Chip Architecture", Pearson Publications, 2nd Edition, 2015

References

1) Shibu K V, "Introduction to Embedded Systems", 2nd Edition, McGraw Hill, 2016.
2) Xiaocong Fan, Real-Time Embedded Systems: Design Prinicple and engineering practices, SCI-Tech Connect, Elsevier, 2016
3) Dr. K. V. K. K. Prasad, "Embedded/Real-Time Systems: Concepts, Design & Programming", Dream Tech Publishers, 2003

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U19EC901 **FPGA Based System Design** **2 0 2 3**

(Lab Integrated)

Course Outcomes

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

1) Understand the various FPGA technologies
2) Implement the arithmetic architectures using Verilog HDL
3) Analyze the FIR and IIR digital filter using FPGA
4) Analyze the FPGA implementation of adaptive filters
5) Implement the hardcore and softcore processors using IP core

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

Unit I **FPGA ARCHITECTURES** **12**

Introduction –FPGA Design flow – Altera FPGA Technologies – Cyclone II FPGA Family – Xilinx FPGA Technologies – Xilinx Spartan 3 Family- Case Study of Frequency Synthesizer – Design with Intellectual property core- Verilog HDL Code Generation using IP Core.

Unit II **COMPUTER ARITHMETIC BASED DSP SYSTEMS USING FPGA** **12**

Introduction- Number representation- Binary Adder and Multiplier using Verilog- Floating Point Arithmetic Implementation using Verilog- MAC and SOP- CORDIC Architecture using Verilog.

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Unit III **FIR AND IIR DIGITAL FILTER USING FPGA** **12**

Digital Filter- FIR Theory- Designing FIR Filter- Constant Coefficients FIR Filters using Verilog HDL –IIR Coefficient Computation – IIR Filter Implementation using Verilog- Fast IIR Filter using Verilog.

Unit IV **FPGA IMPLEMENTATION OF ADAPTIVE FILTERS** **12**

The Fast Fourier Transform (FFT) Algorithms - IP Core FFT Design- Application of Adaptive Filter- Case Study Transform Domain LMS Algorithms - FPGA Design of the LMS Algorithm using Verilog – Recursive Least Square Algorithms using IP Core.

Unit V **FPGA MICROPROCESSOR CORES** **12**

FPGA Microprocessor- Hardcore Microprocessors - Xilinx PowerPC- Altera's ARM- Softcore Microprocessors- An 8-bit processor: the Xilinx PicoBlaze- An 16-bit processor: the Altera Nios- An 32-bit processor: the Xilinx MicroBlaze- Case Studies- T-RISC Stack Microprocessor.

TOTAL : 60 HOURS

Text Book

1. U. Meyer-Baese, Digital Signal Processing with Field Programmable Gate Arrays, 4th Ed. Springer, 2014.
2. Sen M. Kuo Bob H. LeeWenshun Tian, "Real-Time Digital Signal Processing: Implementations and Applications", John Wiley & Sons, Ltd, 2006.

Reference

1. Roger Woods, John McAllister, Gaye Lightbody, Ying Yi, "FPGA Based Implementation of Signal Processing Systems", John Wiley, 2017.
2. K.K. Parhi, "VLSI Digital signal processing systems: Design and implementation", John Wiley, 2007.
3. Lars Wanhammar, "DSP Integrated Circuits", Academic Press, 1999.

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U19EC904 **MACHINE LEARNING** 2 0 2 3

(Lab Integrated)

Course Outcomes

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

1) Realize the significance of machine learning techniques
2) Implement basic machine learning algorithms in Python and Pandas.
3) Design a Machine learning Model with Unconstrained minimization optimization techniques and its parameters..
4) Inscribe a python program for supervised learning and its applications
5) Solve basic classification problems using ANN and unsupervised classification

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
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CO2	2	2	2	3	3	2	1	2	1	1	2		2	2
CO3	2	3	2	1	2		1	2		2	1	2		2
CO4	1	2	3	3		2		1	2	1		1	3	2
CO5	2	2	3	2	3	1	1	1	1	2		3	3	2

Unit I INTRODUCTION TO MACHINE LEARNING AND COST FUNCTION 12

Basics of Vectors and Matrices -Machine learning – Application of Machine learning- Types of Machine learning – Representation of Model- Gradient Descent Algorithm- Cost function Notation for measuring the accuracy of a hypothesis function –Minimize and Maximize the cost function for Single & Two variable functions.

Unit II DATA PRE-PROCESSING USING PYTHON 12

Introduction about Python – Basic Syntax- Python identifiers- Basic Operations of Python – Python Decision Making- Looping – Functions – NumPy -Matplotlib – Introduction to Pandas and Scikit Learn & programming -Data cleaning – Data Integration – Data Reduction -Standard Deviation-Variance-Covariance-Eigen Values & Vectors-PCA

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Unit III MACHINE LEARNING PARAMETERS AND OPTIMIZATION **12**

Confusion Matrix - Sensitivity – Specificity – Precision – Accuracy-False Negative Rate-False Positive Rate & F1 Score-Optimization-Linear vs Nonlinear Programming Problems- Unconstrained minimization: Steepest Descent Method, Newton's Method.

Unit IV SUPERVISED LEARNING ALGORITHMS **12**

Introduction to supervised learning and regression - Statistical Relation between Two Variables and Scatter Plots – steps to establish a Linear Regression using Python– Evaluation of Model Estimators -Introduction and scenarios of Logistic Regression – Building Logistic Regression Model using Python - Maximal Likelihood Estimation using python- Steps to construct a Decision Trees.

Unit V BASICS OF ANN, SVM & UNSUPERVISED LEARNING ALGORITHMS **12**

Introduction to ANN – Biological Neuron – Basic of ANN Architectures – Activation Functions – McCulloch Pitts Model – K-NN – Linear SVM with examples (Vectors) using python – Non-Linear SVM with examples (Vectors) using SVM - Introduction to clustering – Types of Clustering – K- Means Algorithm theory and programs.

TOTAL : 60 HOURS

Text Book

1) Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (India) Private Limited, 2013.
2) Anuradha Srinivasaraghavan, Vincy Joseph , Machine Learning, Wiley-2019

References

1) Alpaydin Ethem, "Introduction to Machine Learning", MIT Press, Second Edition, 2010.
2) Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning: with Applications in R", Springer; First Edition 2013.
3) Dr. Soman K. P., Loganathan, R., and Ajay, V., Machine Learning with SVM and other Kernel methods. PHI Learning Pvt. Ltd., 2009
4) Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014
5) Stephen Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall/CRC Press, Second Edition, 2014

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U19EC912 **SMART SENSORS FOR WEARABLE APPLICATIONS** **3 0 0 3**

Course Outcomes

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

1) Understand the concept of smart sensors.
2) Develop the biomedical applications using displacement and pressure sensors.
3) Demonstrate the various types of wearable sensors for developing smart systems.
4) Develop the computing system for interfacing wearable sensors.
5) Design the basic wearable systems for medical applications

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

Unit I **INTRODUCTION TO SENSORS** **9**

Need for wearable systems, Wearable architcture-Inertia movement sensors, Respiration activity sensor, Wearable bio and chemical sensors, Wearable heat flow sensor- Design considerations & Validation

Unit II **DISPLACEMENT, PRESSURE,TEMPERATURE SENSORS** **9**

Resistive Transducers: Strain Gauge: Gauge factor, sensing elements, configuration, biomedical applications - Strain gauge as displacement & pressure transducers, RTD materials & range, Characteristics, thermistor characteristics, biomedical applications of Temperature sensors

Unit III **SMART SENSORS STANDARDS** **9**

Integrated and Smart sensors - Overview of various smart sensors-Digital temperature sensor (DS1621), Humidity sensor (DHT11), IR sensor, Gas sensor (MQ2,MQ8), Pressure sensors (BMP180), Accelerometers (ADXL335), Flexible sensors.

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Unit IV INTRODUCTION TO WEARABLE DEVICES 9

Motivation for development of Wearable Devices, The emergence of wearable computing and wearable electronics, Types of wearable sensors: Invasive, Non invasive-Intelligent clothing, Industry sectors' overview – sports, healthcare, Fashion and entertainment, military, environment monitoring, mining industry.

Unit V APPLICATIONS OF WEARABLE SYSTEMS 9

Medical Diagnostics and Monitoring for early detection of diseases -Patients with cardiovascular disease- neurological disease- Wearable tongue drive system - Smart Fabrics

TOTAL : 45 HOURS

Text Book

1) "Wearable Sensors -Fundamentals, Implementation and Applications", by Edward Sazonov and Michael R. Neuman, Elsevier Inc., 2014..
2) Jacob Fraden, "Hand Book of Modern Sensors: physics, Designs and Applications", 3rd ed., Springer, 2010.

References

1) Jon. S. Wilson, "Sensor Technology Hand Book", Elsevier Inc., 2005.
2) Subhas C. Mukhopadhyay, "Wearable Electronics Sensors-For Safe and Healthy Living", Springer International Publishing, 2015.
3) Edward Sazonov, Michael R. Newman, "Wearable Sensors: Fundamentals, Implementation and Applications", 2014, 1st Edition, Academic Press, Cambridge
4) "Wearable and Autonomous Biomedical Devices and Systems for Smart Environment", by Aimé Lay-Ekuakille and Subhas Chandra Mukhopadhyay, Springer 2010

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Course Outcomes

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

1) Explain the basic concept in modern data communication and computer networking.
2) Analyze the functions and services of data link layer
3) Categorize the functions and services of network layer
4) Examine the basic functions of transport layer and congestion in networks
5) Analyze the concepts of various network applications and data security

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

Unit I DATA COMMUNICATIONS 9

Components – Direction of Data Flow – Networks – Components and Categories – Types of Connections – Topologies – Protocols and Standards – ISO / OSI Model – Transmission Media – Coaxial Cable – Fiber Optics – Modems – TCP/IP Model

Unit II DATA LINK LAYER 9

Error – Detection and Correction – Parity – LRC – CRC – Hamming Code – Flow Control and Error Control - Stop and Wait – Go Back N ARQ – Selective Repeat ARQ- Sliding Window Techniques – HDLC.LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 – IEEE 802.11–FDDI - SONET – Bridges..

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Unit III NETWORK LAYER 9

Internet Works - Packet Switching and Datagram Approach – IPv4 - IPv6– Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.

Unit IV TRANSPORT LAYER 9

Duties of Transport Layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of Services (QOS) – Integrated Services.

Unit V APPLICATION LAYER 9

Principles of Network Application – Domain Name Space (DNS) – SMTP – FTP – HTTP - E-Mail - The WEB – Principles of Cryptography – Message Integrity – End Point Authentication – Security Email – Network Layer Security- Modes - Security Protocol – IKE - VPN -Transport Layer Security - SSL Architecture-Application Layer Security – E-mail Security - PGP-S/MIME.

TOTAL : 45 HOURS

Text Book

1) Behrouz A. Foruzan, "*Data communication and Networking*", Tata McGraw-Hill, fifth edition, 2017.
2) James F. Kurouse & W.Rouse, "*Computer Networking: A Topdown Approach Featuring*", Pearson Education, sixth edition, 2017.

References

1) Andrew S. Tannenbaum, "*Computer Networks*", PHI, Fifth edition, 2011..
2) William Stallings, "*Data and Computer Communication*", Tenth Edition, Pearson Education, 2017.
3) Larry L.Peterson & Peter S. Davie, "*Computer Networks*", Harcourt Asia Pvt. Ltd., fifth Edition,2011..

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Course Outcomes

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

1) Demonstrate the fundamentals of Internet of Things.
2) Analyze the various protocols for loT.
3) Understand the functionalities of Arduino and Raspberry Pi development boards.
4) Interface the sensors with development boards.
5) Develop the smart IOT systems.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3	2	3				2	3	3	3
CO2	3	2	3	3	3	2	3				2	3	3	3
CO3	3	2	3	3	3	2	3				2	3	3	3
CO4	3	2	3	3	3	2	3				2	3	3	3
CO5	3	2	3	3	3	2	3				2	3	3	3

Unit I FUNDAMENTALS OF IoT 9

Evolution of Internet of Things - Enabling Technologies - loT Architectures: oneM2M, loT World Forum (loTWF) and Alternative loT models - Simplified loT Architecture and Core loT Functional Stack - Fog, Edge and Cloud in loT - Functioral blocks of an loT ecosystem - Sensors, Actuators, Smart Objects and Connecting Smart Objects

Unit II IOT PROTOCOLS 9

loT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11 ah and LoRaWAN - Application Transport Methods: Supervisory Control and Data Acquisition - Application Layer Protocols: CoAP and MQTT

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Unit III IOT DEVELOPMENT BOARDS 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board I/O details, IDE programming - Raspberry Pi - Interfaces and Simple programming using Raspberry Pi with Python environment.

Unit IV INTERFACING OF SENSORS WITH DEVELOPMENT BOARD 9

Introduction and classifications of sensors –Interfacing Arduino with PIR sensor- Potentiometers-Encoders-LM55, DHT11, LDR, ultrasonic sensor-LIDAR- Soil moisture- ESP8266 WiFi module.

Unit V REAL TIME SYSTEM DEVELOPMENT 9

Case study on Smart Street Lighting System -Smart Irrigation System- Smart home

TOTAL : 45 HOURS

Text Book

1) David Hanes, Gonzalo Salgueiro, Patrick Grossetete. Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.
2) Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 2010.

References

1) Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approachl, Universities Press, 2015..
2) Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3) Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014
4) Edward Sazonov, Michael R. Newman, “Wearable Sensors: Fundamentals, Implementation and Applications”, 2014, 1st Edition, Academic Press, Cambridge

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U19EC604 **DIGITAL IMAGE PROCESSING LABORATORY** 0 0 2 1

Course Outcomes

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

1) Write a MATLAB code to demonstrate and perform various operations related to image processing.
2) Generate a LABVIEW code to demonstrate and perform various operations related to image processing.
3) Write a MATLAB code or Generate a LABVIEW code to extract features from Images

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

List of Experiments

Using MATLAB

1) Demonstrating False Contour Effect and Checker board effect
2) Extraction and display of each bit plane of an image for a given 8 bit gray scale image
3) Computing Fourier Transform and reconstruction of original image from Fourier Transform
   a) Without Zero-padding
   b) With Zero-padding
4) Frequency Domain Image Enhancement
   a) Low Pass Filter
   b) High Pass Filter
   c) Band Pass Filter
5) Spatial Domain Image Enhancement
   a) Average Filter
   b) Median Filter
   c) Edge Enhancement
6) Demonstrating JPEG Compression using DCT
7) Creating a degradation model for a given image and applying Wiener Filter
8) Edge Detection Algorithms

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Using Lab VIEW

1) Displaying the Image Properties and Pixel Distance
2) Re-Sample a given image
3) Extraction of planes from a given image - RGB and HSI
4) Scalar processing of an image (Addition, Subtraction, Multiplication and division of a scalar quantity on an image)
5) Image Arithmetic (Addition, Subtraction, Multiplication and division of two image)
6) Computing the DWT of an image and displaying the LL, LH, HL and HL images
7) Computing Discrete Fourier Transform of a given image
8) Extracting 1st Order statistical features of an image (Mean and Standard Deviation alone)
9) Computing the Image Histogram and Histogram equalization for the given image.

TOTAL : 30 HOURS

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U19EC605 **EMBEDDED SYSTEMS LABORATORY** 0 0 2 1

Course Outcomes

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

1) Design an embedded system to get input from and to display using microcontrollers. (8951 Microcontroller, Arduino UNO board and TI MSP430 microcontroller)
2) Design a system by interfacing analog and digital sensors with microcontrollers using various communication protocols. (8951 Microcontroller, Arduino UNO board and TI MSP430 microcontroller)
3) Design a system by interfacing with latest microcontrollers like Intel Galileo Gen 2 board and Raspberry Pi 3 for IOT applications.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	2	2	2	2	1	2	3	3	2
CO2	3	3	3	3	3	2	2	2	2	2	3	3	3	3
CO3	3	3	3	3	3	3	3	3	2	2	3	3	3	3

List of Experiments

The interfacing, programming and simulation of the following 1 to 8 experiments are done with 8951 Microcontroller, Arduino UNO board and TI MSP430 microcontroller using Keil software, Arduino IDE and Code Composer Studio IDE respectively.

1) LED Control using toggle switches and pushbuttons
2) Interfacing matrix keypad ,16 X 2 LCD and 8 X 8 LED Dot Matrix
3) Interfacing Relay and Buzzer
4) PWM Based Speed Control of Servo Motor by Potentiometer.
5) Interfacing analog and digital sensors with microcontrollers based on serial/parallel communication. (UART)
6) Interfacing analog and digital sensors with microcontrollers based on I 2C and SPI protocol.
7) Study of interrupts using IR obstacle sensor and developing a visitor counter
8) Interfacing of microcontrollers with MATLAB
9) Study of Intel Galileo Gen 2 board and its programming
10) Study of Raspberry Pi 3 board, Programming & Simulation in Python Simulators/Tools
11) Real time case study involving design of IOT data logger, WiFi applications by interfacing with microcontrollers

TOTAL : 30 HOURS

22.12.2023

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Regulations 2019

U19EC606 **MINI PROJECT** 0 0 2 1

Course Outcomes

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

1) Identify the thrust areas in Electronics and Communication Engineering and related domains.
2) Formulate the methodology in interdisciplinary mode.
3) Draft the methodology and develop the product/algorithm related to ECE domain.

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

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

- Every project may hold one faculty member appointed by the HOD as a supervisor who is expert in the domain chosen by the team.
- The project problem formulated should be innovative and unique in ECE domain.
- Final solution identified by the student may be converted in to prototype.
- The hours allotted for this course shall be utilized by the students to receive directions from the supervisor to refer the existing literatures and perform the experiments in the lab to come up with the low cost solutions.
- Periodic reviews shall be held by the expert committee identified by the Head of the Department and assessment may be done.
- Monitoring committee may be appointed to regularly monitor the progress work of the student team.
- Final report and relevant documents to be submitted and final assessment will be done by the internal and external examiners appointed by the COE.

22/12/23

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TOTAL : 30 HOURS

22.12.2023

Regulations 2019

Semester –VI	U19GE601: SOFT SKILLS AND APTITUDE – IV (Common to all dept except Civil)	L	T	P	C	Marks
		0	0	2	1	100

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

1. Demonstrate capabilities in job-oriented company selection processes using the hands-on approach
2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in company-specific internal tests

1. Soft Skills	**Demonstrating Soft -Skills capabilities with reference to the following topics:** a. Mock group discussions b. Mock interviews c. Mock stress interviews
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Functions and Polynomials b. Clocks and Calendars c. Data Sufficiency: Introductions, 3 Options Data Sufficiency, 4 Options Data Sufficiency and 5 Options Data Sufficiency. d. Logical reasoning: Cubes, Non Verbal reasoning and Symbol based Reasoning. e. Decision making table and Flowchart Campus recruitment papers: Solving of previous year questions paper of all major recruiters f. Miscellaneous: Cognitive gaming Puzzles-(Picture, Word and Number based), IQ Puzzles, Calculation Techniques and Time Management Strategies. g. Trigonometry.- Concepts
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Writing a story on given pictures g. Company specific verbal questions

30 Hours

18/12/2023

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Professor and Head
Department of Training

Dr. S. ANITA
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U19BM1001	HOSPITAL MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OUTCOMES

On successful completion of this course, the student will be able to

CO1	•	Describe the basics of Hospital Management.
CO2	•	Illustrate the knowledge of Human resource management and marketing in hospitals.
CO3	•	Apply various Quantitative methods in healthcare management.
CO4	•	Amalgamate their knowledge in Hospital information system and supportive services.
CO5	•	Explain the quality and safety aspects in Hospital.

CO/PO, PSO Mapping

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

CO's	Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	2	1	2	2	1	2	1	-	2	1
CO2	2	1	1	-	-	2	1	2	3	1	2	1	-	2	1
CO3	2	1	1	-	-	2	1	2	3	1	1	1	-	2	1
CO4	2	1	1	-	-	2	1	2	2	1	1	1	-	2	1
CO5	2	1	1	-	-	2	1	2	2	1	1	1	-	2	1

UNIT I INTRODUCTION TO HOSPITAL ADMINISTRATION 9

Distinction between Hospital and Industry, Challenges in Hospital Administration, Hospital Planning, Equipment Planning, Functional Planning, Current Issues in Hospital Management, Role of Manager, Leadership, Motivation, Organizational behaviour, Strategic planning, Ethics and Law, Fraud and abuse.

UNIT II HUMAN RESOURCE MANAGEMENT AND MARKETING 9

Principles of HRM, Functions of HRM, Profile of HRD Manager, Tools of HRD, Human Resource Inventory, Manpower Planning. Different Departments of Hospital, Recruitment, Selection, Training Guidelines, Methods of Training, Leadership grooming and Training, Promotion, Transfer.

UNIT III QUANTITATIVE METHODS IN HEALTHCARE MANAGEMENT 9

Introduction to quantitative decision-making methods in healthcare management, Forecasting, Decision making in healthcare facilities, Facility location, Facility layout, Reengineering, Staffing, Scheduling, Productivity, Resource allocation, Supply chain and inventory management, Quality Control, Project Management, Queuing models and capacity planning.

UNIT IV	**HOSPITAL INFORMATION SYSTEM AND SUPPORTIVE SERVICES**	**9**
Clinical Information Systems, Administrative Information Systems, Support Service Technical Information Systems, Medical Records Department, Central Sterilization and Supply Department – Pharmacy, Food Services, Laundry Services, Telemedicine.		
UNIT V	**QUALITY AND SAFETY ASPECTS IN HOSPITAL MANAGEMENT**	**9**
Quality system, Elements, implementation of quality system, Documentation, Quality auditing, International Standards ISO 9000 – 9004. Features of ISO 9001, ISO 14000, Environment Management Systems. NABA, JCI, NABL. Security, Loss Prevention, Fire Safety, Alarm System, Safety Rules.		
		TOTAL : 45 Hours

TEXTBOOKS:

1. R.C. Goyal, Hospital Administration and Human Resource Management, PHI, 4th Edition, 2006.
2. G.D. Kunders, Hospitals – Facilities Planning and Management, TMH, New Delhi, 5th Reprint, 2007.

REFERENCES:

1. Sharon B. Buchbinder and Nancy H. Shanks, Introduction to Healthcare Management, Jones and Bartlett Learning, 2017
2. Blane, David, Brunner, Health and SOCIAL Organization: Towards a Health Policy for the 21st Century, Eric Calrendon Press, 2002.
3. Yasar A. Ozcan, Quantitative Methods in Healthcare management, Jossey Bass- John Wiley and Sons, 2009.

COORDINATOR

K.MANIKANDAN

Asst. Prof /BME

CHAIRMAN

BoS-BME

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

PREAMBLE
To
Municipal Solid Waste Management

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

The overall objectives of the course:

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

COURSE CODE	COURSE NAME	L	T	P	C
U19CE1002	MUNICIPAL SOLID WASTE MANAGEMENT	3	0	0	3

Course Objective (s): The Purpose of learning this course is to:	
1.	Provide a broader understanding on various aspects of sources and solid waste management.
2.	Impart the basic knowledge in the methods and processing of on-site storage.
3.	Provide the basic knowledge of types of collection vehicles and transfer stations.
4.	Aware the students about different techniques involved in off-site processing.
5.	Awareness to be given on disposing the wastes using sanitary landfills.
Course Outcome (s) (COs): At the end of this course, the students will be able to:	
CO1	Identify the sources, types and characteristics of solid wastes. **(K1)**
CO2	Choose the on-site storage methods and processing techniques. **(K2)**
CO3	Summarize the methods of collection and its components. **(K2)**
CO4	Outline the off-site processing techniques & equipment's and resource recovery from solid wastes. **(K3)**
CO5	Evaluate the processing techniques and disposal methods for managing the municipal solid wastes. **(K4)**
Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:	

CO – PO Mapping

Cos	Pos												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	POS
CO1	3	2	-	-	-	2	2	1	-	-	-	-	2	-
CO2	3	-	-	-	-	3	2	-	-	-	-	-	2	-
CO3	3	-	-	-	-	2	2	1	-	-	-	3	2	-
CO4	3	-	-	-	3	3	2	1	-	-	-	3	2	3
CO5	3	3	3	-	3	3	2	1	-	-	-	3	2	3
CO (Avg)	3	1	0.6	-	1.2	2.6	2	0.8	-	-	-	1.8	2	1.2

Correlation Level:	1:Slight (Low)	2:Moderate (Medium)	3:Substantial (High)

UNIT-I	SOURCES AND TYPES	9 Hours

Sources and types of solid wastes - Quantity - factors affecting generation of solid wastes; characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - public health effects. Principle of solid waste management –IOT Applications in Waste management; Public awareness; Role of NGOs; Solid waste management rules 2016 - Construction and demolition Wastes

UNIT-II	ON-SITE STORAGE AND PROCESSING	9 Hours

On-site storage methods - Materials used for containers - on-site segregation of solid wastes - public health & economic aspects of storage - options under Indian conditions - Critical evaluation of options.

UNIT-III	COLLECTION AND TRANSFER	9 Hours

Methods of Residential and commercial waste collection - Collection vehicles - Manpower- collection routes - Analysis of collection systems; Transfer stations - Selection of location, operation & maintenance; options under Indian conditions - Field problems- solving

UNIT-IV	OFF-SITE PROCESSING	9 Hours

Processing techniques and equipment; Resource recovery from solid wastes - Composting, incineration, Pyrolysis - Options under Indian conditions - Case studies.

UNIT-V	DISPOSAL	9 Hours

Dumping of solid waste; Sanitary landfills - Site selection, design and operation of sanitary landfills -Leachate collection and treatment, Land fill bio reactor, Landfill capping, Landfill mining.

TOTAL: 45 Hours

TEXT BOOKS:

1. George Tchobanoglous, "Integrated Solid Waste Management", McGraw-Hill Publishers,2003.
2. Vesilind P.A. and Rimer A.E, "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981

REFERENCES:

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.
2. Landreth R.E, and P.A and Rebers, "Municipal Solid Wastes –problems and Solutions", Lewis Publishers, 2000.
3. Ramachandra T.V, "Management of Municipal Solid Waste", TERI press, New Delhi, 2009.
4. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000
5. http://nptel.iitm.ac.in

22/12/23.

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U19CS1001 BIG DATA ANALYTICS 3 0 0 3

COURSE OUTCOMES:

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

- Compare and analyze different types of digital data characteristics of Big Data
- Implement programs using Hadoop open source software framework
- Design and develop programs using NoSQL Databases like Mongo DB and Cassandra
- Apply MapReduce programming for various big data based problems
- Implement programs using Hive and Pig Databases

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	2	0	1	0	2	1	2	2	2
CO2	2	1	2	2	3	2	0	1	1	2	2	2	2	2
CO3	2	1	2	3	3	2	1	1	1	2	3	2	2	3
CO4	3	1	2	3	3	2	0	1	0	2	3	2	2	3
CO5	2	2	3	3	3	1	0	1	0	2	3	2	3	3

UNIT I INTRODUCTION TO BIG DATA 9

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

UNIT II BIG DATA ANALYTICS 9

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

UNIT III HADOOP 9

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

UNIT IV NO SQL DATABASES 9

Cassandra :Apache Cassandra - An Introduction , Features of Cassandra, CQL Data types, CQLSH, Keyspaces, CRUD (Create, Read, Update and Delete) Operations, Collections, Using a Counter, Time to Live (TTL), Alter Commands, Import and Export, Querying System Tables, Practice Examples- MongoDB, Terms Used in RDBMS and MongoDB, Data Types in MongoDB , MongoDB Query Language

UNIT V HIVE AND PIG 9

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

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

Total: 45 hours

TEXT BOOKS:

1. **Big Data and Analytics**, Seema Acharya, Subhashini Chellappan, Infosys Limited, Publication: Wiley India Private Limited,1st Edition 2015(Chapters 1,2,3,4,5,6,7,8,9,10)

REFERENCE BOOKS:

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

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U19CS1002 CLOUD COMPUTING 3 0 0 3

COURSE OUTCOMES:

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

1. Provide an overview of cloud computing
2. Explain the various tasks in developing cloud services
3. Analyze the provision of cloud computing services to different users
4. Configure the various cloud services according to the environment.
5. Analyze various ways to collaborate online

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	1	2	0	1	0	2	1	2	2	2
CO2	2	1	2	3	3	2	0	1	1	2	2	3	3	3
CO3	2	1	3	3	3	2	0	1	0	3	3	2	3	3
CO4	2	1	2	3	3	2	0	1	0	2	3	3	3	3
CO5	2	2	3	3	3	1	0	1	0	2	3	2	3	3

UNIT I Understanding Cloud Computing **6**

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

UNIT II Developing Cloud Services **10**

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon – Google App Engine – IBM Clouds

UNIT III Cloud Computing for Everyone **10**

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

UNIT IV Using Cloud Services **10**

Collaborating on Calendars, Schedules and Task Management – Exploring Online Calendar Applications- Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Spread sheets- Collaborating on Databases – Storing and Sharing Files

UNIT V Other Ways to Collaborate Online **9**

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis

Total:45 hours

TEXT BOOK:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

REFERENCE BOOK:

1. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

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VI

U19EE1001 **ELECTRIC MOBILITY** **3 0 0 3**

COURSE OUTCOMES

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

- Explain the need for electric and hybrid vehicles fundamentals.
- Describe the energy sources of types of batteries and fuel cells.
- Discuss the various types of motor control design features of Electric vehicle.
- Illustrate the design of various considerations of electric vehicle.
- Explain the hybrid design vehicle technology.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	3	3	3	3	3	1	3	3	3	2
CO2	3	1	2	1	3	3	3	3	3	1	3	3	3	2
CO3	3	3	3	3	3	3	3	2	3	1	3	3	3	2
CO4	3	3	3	3	3	2	3	2	3	1	3	3	3	2
CO5	3	1	2	1	3	3	3	3	3	1	3	3	3	2

UNIT I INTRODUCTION **9**

Need for electric and hybrid vehicles-Comparative study of electric and hybrid vehicles-Limitations of electric vehicles- Petroleum resources- Global warming-Fuel cell vehicles-Optimum solutions for motor, drives and batteries.

UNIT II ENERGY SOURCES **9**

Battery Parameters-Power requirement of electric vehicles- Different types of batteries - Lead acid- Nickel based-Sodium based-Lithium based- Metal Air based. Battery charging- Charger design- Quick charging devices- Battery Modeling. Different type of energy storage – Solar, wind, compressed fluid. Fuel Cell- Fuel cell characteristics- Fuel cell types-Hydrogen fuel cell-Connecting cell in series.

UNIT III PROPULSION MOTORS AND CONTROLLERS **9**

Characteristic of permanent magnet and separately exited DC motors.–Basic Principles of BLDC Motor Drives-Performance Analysis and Control of BLDC Machines- Inverters – DC and AC motor speed controllers.

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UNIT IV DESIGN OF ELECTRIC VEHICLES FUNDAMENTALS 9

Aerodynamic-Rolling resistance- Transmission efficiency- Grading Resistance -Vehicle mass-Electric vehicle chassis and Body design considerations- Heating and cooling systems-Controllers- Power steering-Vehicle Performance.

UNIT V HYBRID VEHICLES 9

Types of Hybrid- Series, parallel, parallel - Advantages and Disadvantages-Hybrid drive prospects-Hybrid technology case studies - Production hybrid-drive cars -Hybrid passenger and goods vehicles.

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

TEXT BOOKS:

1. 1.Mehrdad Ehsani, " Modern Electric, Hybrid Electric and Fuel Cell Vehicles", CRC Press, 2009.
2. Ron HodKinson, " Light Weight Electric/Hybrid Vehicle Design", Butterworth Heinemann Publication, 2005.

REFERENCE BOOKS

1. Iqbal Husain, " Electric and Hybrid Vehicles-Design Fundamentals", CRC Press, 2003.
2. Jack Erjavec, "Hybrid, Electric & Fuel-Cell Vehicles", Delmar, Cengage Learning, 2013.
3. James Larminie and John Lowry, "Electric Vehicle Technology Explained " John Wiley &Sons, 2003.

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U19EE1002 **ENERGY CONSERVATION AND MANAGEMENT** **300 3**

COURSE OUTCOMES

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

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3		2			2	3	3	3	2
CO2	2	2	3	3	3				2			3	3	2
CO3	2	2	3	3	3	3			3		2	3	3	2
CO4	2	2	3	3	3	2		3				3	3	2
CO5	2	2	3	3	3		3			3		3	3	2

UNIT- I ENERGY SCENARIO AND BASICS 9

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

UNIT- II ENERGY MANAGEMENT AND AUDIT 9

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

UNIT- III LIGHTING SYSTEMS 9

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

UNIT- IV ENERGY CONSERVATION IN BUILDINGS 9

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

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UNIT-V ENERGY EFFICIENT OPPORTUNITIES IN UTILITIES **9**

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

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

Lecture: 45; Tutorial: 00; Total: 45

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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U19EE1003 INNOVATION, IPR AND ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3

COURSE OUTCOMES

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

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1			3			3	3		3	3	3	3		3
CO2			3			3	3	3	3	3	3	3		3
CO3			3			3	3	3	3	3	3	3		3
CO4			3			3	3	3	3	3	3	3		3
CO5			3			3	3	3	3	3	3	3		3

UNIT I ENTREPRENEURSHIP&MOTIVATION 9

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

UNIT II INNOVATION, CREATIVITY, DEVELOPMENT PROCESS AND LEGAL ASPECTS 9

Innovation and Creativity- An Introduction, Innovation in Current Environment, Types of Innovation Sources of new Ideas, Methods of generating innovative ideas, creating problem solving, product planning and development process. Legal aspects of business (IPR, Labor law).

UNIT III BUSINESS 9

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

UNIT IV FINANCING AND ACCOUNTING 9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, GST.

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UNIT V SUPPORT TO ENTREPRENEURS 9

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

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

TEXT BOOKS:

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

REFERENCES:

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

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U19EE1004 **RENEWABLE ENERGY SYSTEMS** **3 00 3**

COURSE OUTCOMES

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

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2					2		2	3	3	3
CO2	3	3	3	2	1	3	3	1	2		3	3	3	3
CO3	3	3	3	2	2	3	3	1	2		3	3	3	3
CO4	3	3	3	2	2	3	3	1	2		3	3	3	3
CO5	3	3	3	2	2	3	3	1	2		3	3	3	3

UNIT I INTRODUCTION 9

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

UNIT II SOLARENERGY SYSTEMS 9

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

UNIT III WIND AND BIOMASS ENERGYSYSTEMS 9

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

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

UNIT IV GEOTHERMAL, TIDAL AND OCEAN ENERGY SYSTEMS 9

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

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

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UNIT V EMERGING ENERGY SYSTEMS 9

Magneto Hydro Dynamic (MHD) Power Generation- MHD systems and its operation. Thermo Electric power generation- Basic principle- Thermo electric power generator.

Thermonuclear fusion energy-Nuclear fusion and reactions- Advantages. Fuel cell- classification of fuel cells- Fuel cell based electrical power generation scheme- Applications.

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

TEXT BOOKS:

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

REFERENCE BOOK

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

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U19FT1001 FUNDAMENTALS OF FASHION DESIGN 3 0 0 3

COURSE OUTCOMES

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

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO12	PSO1	PSO2	PSO3
CO1	3	3	3							3	3	3	3	3
CO2	3	3	3									3	3	3
CO3	3	3	3								3	3	3	3
CO4	3	3	3								3	3	3	3
CO5	3	3	3							3	3	3	3	3

UNIT I Introduction to Fashion **9**

Origin of fashion - terms and definitions - reasons for change in fashion - classification of fashion – Style, Classic, FAD, Trend – theories of fashion – movement of fashion - fashion cycle.

UNIT II Introduction to Clothing **9**

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

UNIT III Selection of clothes **9**

Clothes for children, middle-aged and adults. Types of clothes according to different types of human figure, Different materials for different clothes, Fabrics and colours suitable for different garments.

Planning for clothing needs: Formal clothing, Clothes for parties, Clothes for sports, Casual Clothes for casualwear. Wardrobe Planning: Wardrobe for men and women

UNIT IV Elements and Principles of Design **9**

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Elements of Design: Introduction on basics Elements of design - Silhouette, Details, Texture, Color, Lines,

Principle of design: Introduction to principles of Elements of design - Proportion, Balance, Rhythm, Center of Interest, Harmony

UNIT 5 Design and Development **9**

Boards: Mood board, fabric board, colour board, accessory board. Fashion illustration – head theories, Illustration techniques – strokes, hatching, shading; Colouring techniques – Medias for colouring. Portfolio presentation – styles of presentation - Fashion shows.

TOTAL: 45 hours

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TEXT BOOKS

1. Munslow, Janine, McKelvey, Kathryn "**Fashion Design Process Innovation and Practice**", 2nd Edition, wiley, 2012.
2. Nicola White, Ian Griffiths, "**The Fashion Business Theory, Practice, Image**", Berg, 2000.

REFERENCE

1. Sumathi, G. J. **Elements of fashion and apparel design**. New Age International, 2007.
2. Kathryn McKelvey "**Fashion Source Book**" Balckwell Publishing New Delhi.
3. Mills, Jane, and Janet K. Smith. **Design concepts**. Fairchild Books, 1985.
4. Rasband J. **Wardrobe strategies for women**. Fairchild Publications; 2002.
5. Jarnow JA, Judelle B, Guerreiro M**. Inside the fashion business**. Wiley; 1981.

U19FT1002 GARMENT MANUFACTURING TECHNOLOGY 3 0 0 3

COURSE OUTCOMES

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

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

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2						3	3	2
CO2	3	3	3	3	3	3	1					3	3	2
CO3	2	3	3	3	3	3	3					3	3	3
CO4	3	3	3	3	3	3	3	3				3	3	2
CO5	2	3	2	3	3		3	2				3	3	2

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

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

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

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

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

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

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

Unit III Garment Accessories 9

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

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

Sewing Process: Garment basic components and assembly process.

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

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

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Professor & Head
Department of Fashion Technology
Sona College of Technology
Salem - 636 005. Tamil Nadu

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

UNIT V Defects in garment, pressing and Packing 9

Defects: Common defects in woven fabric, knitted fabric and garment.
Garment pressing: Pressing types and pressing equipments.
Packing: Types of packing and different types of packing materials.

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Professor & Head
Department of Fashion Technology
Sona College of Technology
Salem - 636 005. Tamil Nadu

TOTAL: 45 hours

TEXT BOOKS

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

REFERENCE

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

U19IT1004 INTRODUCTION TO DATABASE TECHNOLOGY 3 0 0 3

PREAMBLE

The objective of this course is to introduce the concepts of database systems. Any of the digital applications used by the people be it web applications or mobile applications run with the database in the background. For any e-commerce application like flipkart or amazon, database is the core requirement. Social media sites like Facebook or Twitter stores all the content such as user profiles, likes, shares, and messages in the database. All the organizations maintain their data in the database with lots of security features. Working with a database system is the most important skill needed by the IT industry.

The course is designed in such a way that the students will acquire necessary skills to store, manipulate and retrieve data. The students will learn the fundamental concepts of database systems and write queries to manipulate the database. The students will have hands on experience in working with an open source database management system. This course is designed for the students of both circuit (EEE, ECE) and non-circuit branches (Mechanical, Civil and Fashion Technology).

COURSE OUTCOMES

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

1. Comprehend the need, background, architecture and evolution of database management system
2. Construct ER diagrams that capture the requirements of an application and map the ER diagram to relational databases
3. Write SQL queries to create, maintain, retrieve, manipulate and provide security to databases.
4. Design and evaluate the normality of a logical data model, and correct any anomalies.
5. Summarize the general ideas behind indexing techniques

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3						1	1		1	2	3
CO2	3	3	2	1	1				1	1		1	2	2
CO3	3	3	3	1	1				1	1		1	2	2
CO4	3	3	3	1	1				1	1		1	2	2
CO5	3	1							1	1		1		

UNIT I INTRODUCTION 9

Database and Database Users: Characteristics of database approach, Advantages of DBMS Approach, Database Applications

Database system concepts and architecture: Data models, Schemas, Instance, Three schema architecture and data independence, DBMS languages, DBMS interfaces, database system Environment

UNIT II ENTITY RELATIONSHIP AND RELATIONAL MODEL 9

ER model: Entity types, attributes, keys,, relationship types, constraints, weak entity, ER diagrams, EER concepts

Relational data model, relational constraints and relational Algebra: Relational model concepts, Relational constraints and Relational data base schema, update operations, basic Relational algebra operations, additional relational operations, ER to relational mapping

UNIT III QUERY LANGUAGE 9

SQL: Data definition and constraints, Basic queries, insert, delete, update, Joins, complex queries, views, assertions and triggers

Database security and Authorization: security issues, grant/revoke privileges, SQL injections

UNIT IV RELATIONAL DATABASE DESIGN 9

Functional dependencies and normalization: Functional dependencies, Normal forms: 1NF, 2NF, 3NF, Boyce Codd NF, decomposition

UNIT V STORAGE STRUCTURES AND INDEXING 9

Secondary Storage Devices – Placing file records – Operations on files – unordered files – ordered files - hashing – RAID - **Indexing Structures:** Types of Single-Level Ordered Indexes, Multilevel Indexes

Total: 45 hours

TEXT BOOK

1. Ramez Elmasri and Shamkant Navathe, "Fundamentals of Database Systems ", 6th Edition, Addison-Wesley, 2014.

REFERENCES

1. Abraham Silberschatz, Henry F. Korth and Sudarshan. S, "Database System Concepts", 6th Edition, McGraw-Hill, 2016
2. Raghu Ramakrishnan,"Database Management System", Tata McGraw-Hill Publishing Company, 2003
3. Date. C. J, Kannan. A, Swamynathan. S, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2012
4. Rajesh Narang, "Database Management systems", PHI Learning pvt. Ltd, New Delhi,201

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Department of Mechatronics Engineering

Open Elective

U19MC1004	FUNDAMENTALS OF ROBOTICS	L	T	P	C
		3	0	0	3

Course Outcomes

After successful completion of this course, the students should be able to

CO1:	Understand the basic robotic concepts
CO2:	Select the suitable drive system for robot application
CO3:	Select the suitable sensors and grippers for the respective application
CO4:	Develop VAL Programming for simple applications
CO5:	Illustrate the robotic application in various sectors

Pre-requisite

NIL

CO/PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2			3	2		3		3	3	3	3
CO2	2	2	2		3				3		2	3	2	3
CO3	3	2	2		3				3		2	3	3	3
CO4	3	3	3	3	3				3		2	3	3	2
CO5	3	3	3	3	3	3	3		3			2	3	3

Course Assessment methods

Direct		Indirect
Internal test I (8) Internal test II (8) Internal test III (8) Assignment/seminar/Quiz (5)	Online test (6) Attendance (5) End semester Examination (60)	Course end survey

Unit 01: INTRODUCTION TO ROBOTICS — **9 Hours**

Introduction to Robotics – History of Robotics – Laws of Robotics - Anatomy of a Robot – Classification of Robots – Robot Configurations - Robot subsystems: Motion subsystem, Recognition subsystem, Control subsystem – Robot Links – Joints in robot –Robot Specifications.

Unit 02: ROBOT MOTIONS AND DRIVE SYSTEMS	9 Hours
Degrees of freedom – DOF associated with arm and body - DOF associated with wrist –Joint Notation scheme-Robot Kinematics – Robot Drive systems – Hydraulic Actuators – Pneumatic actuators – Electrical actuators: Stepper motors, DC motors, Servomotor.	
Unit 03: ROBOT SENSORS AND END EFFECTORS	**9 Hours**
Classification of Robotic sensors and their functions – Tactile sensors – Inductive Proximity sensor – Hall effect sensor – Range sensor –Force ant Torque sensors- Types of end effectors – Mechanical grippers – Vacuum cups – Magnetic grippers – Adhesive grippers – Tools as end effectors.	
Unit 04: ROBOT PROGRAMMING	**9 Hours**
Methods of Robot Programming: Lead through methods, Textual robot Languages – Robot language structure – First generation Languages – Second generation Languages – VAL Programming – Simple Programming examples.	
Unit 05: ROBOT APPLICATIONS	**9 Hours**
Robotics Applications in Manufacturing: Welding Robot, AGVs– Healthcare: Surgery Robot, Therapeutic Robot – Agriculture: Crop Harvesting & Fruit Picking Robot – Defence & Space: Exoskeleton Robot, Telerobotics.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Total Hours: 45 Hrs

TEXT BOOKS

1. M.P.Groover, M.Weiss,R.N. Nagal,N.G.Odrey, "Industrial Robotics - Technology, programming and Applications" Tata McGraw-Hill Publication, 2012.

REFERENCES

1. Richard D.Klafter, "Robotics Engineering" PHI Learning Private Limited, 2009.
2. Ganesh S.Hedge, "A text book in Industrial Robotics", Laxmi Publications, 2006.
3. S K Saha, "Introduction to Robotics", Tata McGraw-Hill Publication, 2012.
4. Sathya Ranjan Deb, "Robotics Technology & flexible Automation" Second edition, Tata McGraw-Hill Publication, 2009.

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COURSE CODE **U19ME1004** L T P C

COURSE NAME **RENEWABLE ENERGY SOURCES** 3 - - 3

Prerequisites- subject: Environmental Sciences.

Course Outcomes

Upon completion of this course the students will be able to

CO1 Discuss the power demand scenario in world level and impact of various renewable energy sources in satisfying power demand.

CO2 Explain the different components and the principle of operation and the application of solar PV system and Bio Mass power generation system.

CO3 Outline in the components and to find the suitability based on the performance of wind energy conversion system, geothermal and hydel power system.

CO4 Describe the components of tidal power generation scheme and wave energy scheme and to discuss the performance of two schemes.

CO5 Compare and contrast the various components and methods of Ocean Energy Conversion Systems.

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

COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO – 1	3	3	3	-	3	3	3	2	3	3	2	3	3	3
CO – 2	3	-	3	3	3	3	3	-	3	3	3	3	3	3
CO – 3	3	3	3	2	3	3	3	-	3	3	3	3	3	3
CO – 4	3	3	3	2	3	3	3	-	3	3	2	3	3	3
CO – 5	3	2	3	3	3	3	3	2	3	3	2	3	3	3

Unit I **INTRODUCTION** L 9 T 0

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

Unit II **SOLAR & BIO ENERGY** L 9 T 0

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

Unit III **GEO THERMAL AND HYDRO ENERGY SOURCES** L 9 T 0

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

Unit IV WIND AND TIDAL ENERGY L 9 T 0

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

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

Unit V OTHER RENEWABLE ENERGY SOURCES L 9 T 0

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

Total Number of hours: 45

Learning Resources

Text Books

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

Reference Books

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

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Syllabi for

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

B.E/B.Tech Honours

B.E/B.Tech Minor

courses

Course Outcomes

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

1) Explain the sources of power dissipation in an IC.
2) Estimate Power dissipation of various MOS logic circuits.
3) Apply the synthesis and optimization procedures for low power dissipation at the algorithm, architecture, logic and circuit level.
4) Design of low-power MOS SRAMs.
5) Analyze the software design techniques for low power.

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

Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	3				2	3	3	3
CO2	3	3	3	3	3	2	3				2	3	3	3
CO3	3	3	3	3	3	2	3				2	3	3	3
CO4	3	3	3	3	3	2	3				2	3	3	3
CO5	3	2	3	3	3	2	3				2	3	3	3

Unit I POWER DISSIPATION IN CMOS 9

Introduction – Sources of Power Dissipation – Designing for Low power – Physics of Power Dissipation in MOSFET Devices – Power Dissipation in CMOS – Hierarchy of Limits of Power – Fundamental-Material- Device-Circuit and System limits.

Unit II POWER ESTIMATION 9

Modeling of Signals – Signal Probability Calculation – Probabilistic Techniques for Signal Activity Estimation – Statistical Techniques – Estimation of Glitching Power – Sensitivity Analysis – Power Estimation Using Input Vector Compaction – Power Dissipation in Domino CMOS – Circuit Reliability – Power Estimation at the Circuit Level.

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Unit III SYNTHESIS FOR LOW POWER 9

Behavioral Level Transforms – Algorithm Level Transforms for Low Power – Architecture Driven Voltage Scaling – Power Optimization using Operation Reduction – Power Optimization using Operation Substitution – Logic Level Optimization for Low Power – Circuit Level.

Unit IV LOW-POWER STATIC RAM ARCHITECTURES 9

Introduction – Organization of a Static RAM – MOS Static RAM Memory Cell – Banked Organization of SRAMs – Reducing Voltage Swings on Bit Lines – Reducing Power in the Write Driver Circuits – Reducing Power in Sense Amplifier Circuits.

Unit V SOFTWARE DESIGN FOR LOW POWER 9

Sources of Software Power Dissipation – Software Power Estimation – Software Power Optimizations – Automated Low-Power Code Generation – Co-design for Low Power.

TOTAL : 45 HOURS

Text Books

1) Roy K. and Prasad S.C. , *"Low Power CMOS VLSI circuit design,"* Wiley,2011.

2) Kuo J.B and Lou J.H, *"Low voltage CMOS VLSI Circuits"*, Wiley 2017.

References

1) Jan Rabaey,"Low Power Design Essentials (Integrated Circuits and Systems)", Springer, 2009.

2) Dimitrios Soudris, Chirstian Pignet, Costas Goutis, *"Designing CMOS Circuits For Low Power"*, Kluwer, 2010.

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U19EC2041 **VALIDATION AND TESTING TECHNOLOGY** 3 0 0 3

Course Outcomes

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

1) Describe the testing and verification process.
2) Explain various data types of system Verilog.
3) Analyze the procedural statements and routine.
4) Develop testbench programs.
5) Analyze the verification in case study using system Verilog.

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

Unit I INTRODUCTION TO VERI FICATION 9

Introduction to Testing - The Verification Process - The Verification Methodology- Basic Test bench Functionality - Directed Testing - Methodology Basics - Functional Coverage - Test bench Components- Test bench Performance.

Unit II SYSTEM VERILOG DATATYPES 9

Built-In Data Types- Fixed-Size Arrays- Dynamic Arrays - Dynamic Arrays - Linked Lists - Array Methods - Creating New Types with typedef- Type conversion - Constants - Strings.

Unit III PROCEDURAL STATEMENTS AND ROUTINES 9

Procedural Statements- Tasks. Functions. and Void Functions - Task and Function Overview- Task and Function Overview- Returning from a Routine- Local Data Storage - Time Values.

Unit IV CONNECTING THE TESTBENCH AND DESIGN 9

Separating the Test bench and Design-The Interface Construct - Stimulus Timing- Interface Driving and Sampling - Connecting It All Together- Top-Level Scope - Program - Module Interactions- System Verilog Assertions - The Four-Port ATM Router.

Unit V SYSTEM VERILOG TESTBENCH 9

Design Blocks – Test bench Blocks - Alternate Tests – Case study of various embedded applications using system Verilog.

TOTAL : 45 HOURS

Text Books

1) Chris Spear, "System V erilog for Verification", Springer, 2008.
2) Mike Mintz, Robert Ekendahl, "Hardware Verification with System Verilog", Springer Publishing 2007.

References

1) M. Morris Mano and Michael D. Ciletti – 'Digital Design with an Introduction to the Verilog HDL', 6th Edition, Pearson Education, 2018
2) J. Bhasker "A Verilog HDL Primer, Third Edition", 3th Edition, Star Galaxy Publishing, 2018.

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U19ADS2038 **MACHINE LEARNING** **3 0 2 4**

COURSE OUTCOMES

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

1. Classify different types of learning and apply linear regression
2. Illustrate the concepts of logistic regression and implement the same with python.
3. Apply the concepts of Neural networks and support vector machines
4. Evaluate the hypothesis based on factors like bias and variance
5. Demonstrate the concepts of clustering, dimensionality reduction and anomaly detection.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	1				1	1		1	2	2
CO2	3	3	3	3	3				1	1		1	2	2
CO3	3	3	3	3	3				1	1		1	2	2
CO4	3	3	3	1	1				1	1		1	2	2
CO5	3	3	1	1	1				1	1		1	2	2

UNIT I INTRODUCTION AND LINEAR REGRESSION **9**

Introduction to Artificial Intelligence - What is machine learning? – Supervised Learning – unsupervised learning – Linear Regression – cost function – gradient descent algorithm – normal equation - Gradient descent for multiple variables – feature scaling – learning rate – polynomial regression – normal equation

UNIT II LOGISTIC REGRESSION **9**

Hypothesis representation – decision boundary – nonlinear decision boundaries – cost function – gradient descent – advanced optimizations – multi class classification problems – **Regularization** - Problem of overfitting – cost function optimization for regularization – regularized linear regression – regularization with normal equation - regularized logistic regression

UNIT III NEURAL NETWORKS AND SUPPORT VECTOR MACHINES **9**

Overview and summary – neurons and brain – model representation – artificial neural networks representation – example – multiclass classification – cost function – back propagation algorithm – gradient checking – random initialization – Support vector machines – optimization objective – cost function – large margin intuition – decision boundary – kernels – adapting to nonlinear classifiers- Introduction to Decision Trees – K-NN classifier

UNIT IV ADVICE FOR APPLYING MACHINE LEARNING **9**

Debugging a learning algorithm – evaluating a hypothesis – model selection and training, validation test sets – bias Vs variance – regularization and bias/variance – learning curves machine learning system design

UNIT V OTHER TOPICS 9

Unsupervised learning – k-means algorithm – optimization objective – choosing number of clusters - Dimensionality reduction – principle component analysis - Anomaly detection – algorithm – developing and evaluating the algorithm – anomaly detection Vs supervised algorithm

THEORY: 45 HRS **PRACTICALS: 30 HRS** **TOTAL: 75 HOURS**

REFERENCES

1. Stanford's machine learning course presented by Professor Andrew Ng – online resource - http://www.holehouse.org/mlclass/
2. James, G., Witten, D., Hastie, T., Tibshirani, R, "An Introduction to Statistical Learning with Applications in R", Springer, 2013.
3. Tom M. Mitchell, "Machine Learning", 1st edition, McGraw Hill Education, 2017.
4. Ethem Alpaydın, "Introduction to Machine Learning", The MIT Press, 2nd edition, 2013.
5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
6. Sebastianraschka, "Python Machine Learning", Packt Publishing Ltd., 2017.

LIST OF EXPERIMENTS

1. Write a program to implement simple linear regression to minimize the cost function.
   Sample Exercise: In AB Company, there is a salary distribution table based on Year of experience. Y*ou are a* HR officer and you got a candidate with 5 years of experience. Plot the given data. and find the best salary to offer the candidate.

2. Build a logistic regression model to classify the data in the given dataset.
   Sample Exercise: Suppose that you are the administrator of a university department and you want to determine each applicant's chance of admission based on their results on two exams. You have historical data from previous applicants that you can use as a training set. For each training example, you have the applicant's scores on two exams and the admissions decision. Write a program to build a classification model (logistic regression) that estimates the probability of admission based on the exam scores.

3. Write a program to fit a logistic regression model with regularization to avoid overfitting of the given dataset.

4. Load the given dataset, split it into train and test sets, then estimate the mean squared error (MSE) for a linear regression as well as the bias and variance for the model error over 100 bootstrap samples.

5. Apply K means algorithm to cluster a set of data stored in a .CSV file and plot the clusters

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U19ADS2042 **DATA VISUALIZATION** **3 0 2 4**

COURSE OUTCOMES

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

1. Explain the fundamentals of Exploratory Data Analysis.
2. Explore the significance of different data transformation techniques.
3. Implement correlation and time series data analysis.
4. Evaluate different datasets with NumPy and Pandas.
5. Apply data exploration and visualization techniques with Matplotlib on different datasets.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2			2	2	2	2	2	2
CO2	3	3	3	3	3	2			2	2	2	2	2	2
CO3	3	3	3	3	3	2			2	2	2	2	2	2
CO4	2	3	3	3	3	2			2	2	2	2	3	3
CO5	2	3	3	3	3	2			2	2	2	2	3	3

UNIT I INTRODUCTION TO DATA VISUALIZATION IN EDA 9

Exploratory Data Analysis (EDA) fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA.

UNIT II DATA TRANSFORMATION TECHNIQUES 9

Technical requirements - merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.

UNIT III CORRELATION AND TIME SERIES ANALYSIS 9

Introducing Correlation – Types of analysis – Discuss multivariate analysis using the Titanic dataset – Outline Simpson's paradox – Understand the time series dataset – TSA with open power system data.

UNIT IV BUILDING VISUALIZATIONS 9

Chart your data - Chart design principles, Google sheet charts, Bar and Column charts, Histograms, Pie, Line and Area charts, Data wrapper charts, Annotated charts, Range charts, Scatter and Bubble charts, Tableau public charts, Filtered Line chart – Map your data – Table your data.

UNIT V CODE TEMPLATES AND ADVANCED TOOLS 9

Edit and Host code with GitHub – Chart.js and Highcharts templates – Leaflet map templates – Transform your map data – Geospatial data and GeoJSON, Find GeoJSON Boundary files, Draw and edit GeoJson.io, Edit and join with Mapshaper.

THEORY: 45 HRS **PRACTICALS: 30 HRS** **TOTAL: 75 HOURS**

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020. (Unit 1, 2 and 3)
2. Jack Dougherty, Ilya Ilyankou, "Hands-On Data Visualization", O'Reilly Media, Apr 2021. (Unit 4 and 5)

REFERENCES:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2018.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.
4. Fabio Nelli, "Python Data Analytics with Pandas, Numpy and Matplotlib", Apress, 2nd Edition, 2018.

LIST OF EXPERIMENTS:

1. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
2. Perform Time Series Analysis and apply the various visualization techniques.
3. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect and user interaction.
4. Build cartographic visualization for multiple datasets involving various countries of the world, states, and districts in India etc.
5. Perform EDA on Wine Quality Data Set and Map data transformation using advanced tools.

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U19CS935 **ETHICAL HACKING** **3 0 0 3**

COURSE OUTCOMES

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

- Describe the ethical and legal aspects of ethical hacking .
- Perform penetration testing using metasploit framework.
- Exploit the vulnerabilities present in the different operating systems and web applications.
- Perform the vulnerability analysis using different tools.
- Penetrate the victim's network / system using privilege escalation.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	P09	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	1.	3	1	2	3	3	3	3	2	3	2	2	2
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
CO3	3	3	3	3	3	2	2	3	3	3	2	3	3	3	2
CO4	3	3	2	3	2	1	2	3	3	3	3	3	3	2	2
CO5	3	3	1	3	1	2	3	3	3	3	2	3	2	2	2

UNIT I INTROCUTION TO ETHICAL DISCLOSURE 9

Ethics of ethical hacking – Ethical hacking and the legal system – proper and ethical disclosure.

UNIT II PENETRATION TESTING AND TOOLS 9

Social engineering attacks – Physical penetration attacks – Insider attacks – Using the Backtrack Linux distribution – Using the Metasploit framework – Managing a penetration test.

UNIT III EXPLOITATION 9

Programming survival skills – Basic Linux exploits – Windows exploits – Understanding and detecting Content-Type attacks – Web application security vulnerabilities.

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UNIT IV VULNERABILITY ANALYSIS 9

Passive analysis – Advanced static analysis with IDA pro – Client side browser exploits – Exploiting the windows access control model – From vulnerability to exploit – Closing the holes: Mitigation.

UNIT V PENETRATION 9

Acquiring situation awareness – Privilege escalation – Maintaining access – Installing backdoors – Identifying and exploiting further targets.

TOTAL: 45hours

TEXT BOOK:

1. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey and Terron Williams, "Gray Hat Hacking The Ethical Hackers Handbook", 3rd Edition, McGraw Hill Education, 2017.

REFERENCES:

1. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide", Auerbach Publications, 2014.
2. Stephen Fletcher, "Hacking with Kali Linux: A Beginner's Guide to Ethical Hacking with Kali and Cybersecurity, Includes Linux Command Line, Penetration Testing, Security Systems and Tools for Computer", Monticello Solutions Ltd, 2020.
3. Jon Erickson, "Hacking: The Art of Exploitation", Second Edition, No Starch Press, 2008.

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U19CS2049 DIGITAL FORENSICS 3 0 0 3

COURSE OUTCOMES:

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

- Describe the basic principles of digital forensics.
- Apply the suitable data acquisition technique to collect the forensic data.
- Apply the different techniques to collect digital evidences from the acquired data.
- Validate the digital evidences and write report on the collected digital evidences.
- Apply the Sleuth Kit Autopsy tool to perform forensics on images and disks

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

UNIT I INTRODUCTION **9**

An Overview of Digital Forensics - Preparing for Digital Investigations - Maintaining Professional Conduct - Preparing a Digital Forensics Investigation - Procedures for Private-Sector High-Tech Investigations - Understanding Data Recovery Workstations and Software - Conducting an Investigation.

UNIT II DATA ACQUISITION **9**

Understanding Storage Formats for Digital Evidence - Determining the Best Acquisition Method - Contingency Planning for Image Acquisitions - Using Acquisition Tools - Validating Data Acquisitions - Performing RAID Data Acquisitions - Using Remote Network Acquisition Tools - Using Other Forensics Acquisition Tools.

UNIT III PROCESSING CRIME AND INCIDENT SCENES **9**

Identifying Digital Evidence - Collecting Evidence in Private-Sector Incident Scenes - Processing Law Enforcement Crime Scenes - Preparing for a Search - Securing a Digital Incident or Crime

Scene - Seizing Digital Evidence at the Scene - Storing Digital Evidence - Obtaining a Digital Hash.

UNIT IV DATA VALIDATION AND REPORT WRITING 9

Determining What Data to Collect and Analyze - Validating Forensic Data - Understanding the Importance of Reports - Guidelines for Writing Reports - Generating Report Findings with Forensics Software Tools.

UNIT V DIGITAL FORENSIC TOOLS 9

Evaluating Digital Forensics Tool Needs - Digital Forensics Software Tools - Digital Forensics Hardware Tools – Validating and Testing Forensics Software – **Case Study:** Sleuth Kit Autopsy tool.

TOTAL: 45hours

TEXT BOOK:

1. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 6th ed., Cengage Learning, 2019.

REFERENCE BOOKS:

1. Eoghan Casey, "Handbook of Digital Forensics and Investigation", 1st edition, Academic Press, 2009.
2. Marjie T. Britz, "Computer Forensics and Cyber Crime", 3rd edition, Pearson Education, 2013.
3. Richard Boddington , "Practical Digital Forensics", 1st edition, Packt Publisher, 2016
4. Aaron Philipp, David Cowen and Chris Davis, "Hacking Exposed Computer Forensics: Computer Forensics Secrets & Solutions", Second Edition, McGraw Hill, 2009
5. Dejey and Murugan, "Cyber Forensics", 1st edition, Oxford Press, 2018.

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