Curriculum and Syllabi

BACHELOR OF TECHNOLOGY
IN
ELECTRONICS & COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
FACULTY OF ENGINEERING AND TECHNOLOGY
2019 onwards

Curriculum & Syllabus

B.Tech. in ECE

(General Branch)

2019 onwards

SGT UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM- 2019-2020
B. Tech.-ECE – I Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1	13040101	Engineering Mathematics-I	3	1	0	4	40	60	100
2	13040102	Engineering Physics	3	1	0	4	40	60	100
3	13040103	Basics of Electronics Engineering	3	0	0	3	40	60	100
4	13040104	Fundamental of Computer Programming	3	0	0	3	40	60	100
5	13040106	Engineering Graphics and Design	1	0	0	1	40	60	100
6	13040107	Engineering Physics Lab	0	0	2	1	20	30	50
7	13040108	Basic Electronics Engineering Lab	0	0	2	1	20	30	50
8	13040109	Fundamental of Computer Programming Lab	0	0	2	1	20	30	50
9	13040110	Engineering Graphics and Design Lab	0	0	4	2	20	30	50
10	13040112	Engineering Lab	0	0	4	2	20	30	50
Total Contact Hours			**13**	**2**	**14**	**22**	**300**	**450**	**750**
			29						

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM-ECE- 2019-2020
B. Tech. – II Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1	13040201	Engineering Mathematics-II	3	1	0	4	40	60	100
2	13040202	Industrial Chemistry	3	1	0	4	40	60	100
3	13040203	Communication Skills	2	0	0	2	40	60	100
4	13040206	Workshop Technology	1	0	0	1	40	60	100
5	13040204	Basics of Electrical Engineering	3	0	0	3	40	60	100
6	13040212	Environment science	0	0	0	0	40	60	100
7	13040207	Industrial Chemistry Lab	0	0	2	1	20	30	50
8	13040208	Communication Skills Lab	0	0	2	1	20	30	50
9	13040211	Workshop Technology Lab	0	0	4	2	20	30	50
10	13040209	Basics of Electrical Engineering Lab	0	0	2	1	20	30	50
Total			**12**	**2**	**10**	**19**	**320**	**480**	**800**
			24						

FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM- 2019-2020
B. Tech.-ECE – III Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1	13040301	Digital Electronics & Computer Organization	3	0	0	3	40	60	100
2	13040302	Signals & Systems	3	0	0	3	40	60	100
3	13040303	Network Theory	3	0	0	3	40	60	100
4	13040304	Micro Electronics	3	0	0	3	40	60	100
5	13040305	Engineering Mathematics III	3	1	0	4	40	60	100
6	13040306	Industrial Economics and Management	2	0	0	2	40	60	100
7	13040307	Constitution of India	2	0	0	0	40	60	100
8	13040310	Digital Electronics & Computer Organization Lab	0	0	2	1	20	30	50
9	13040311	Network Theory Lab	0	0	2	1	20	30	50
10	13040312	Circuit Simulation with PCB design Lab	0	0	4	2	20	30	50
11	13040315	Minor Project phase-I	0	0	2	1	20	30	50
12	13040316	Industrial Training –I	0	0	0	1	20	30	50
Total			**19**	**1**	**10**	**24**	**380**	**570**	**950**
			30						

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM- 2019-2020

B. Tech. -ECE– IV Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1	13040401	Analog Integrated Circuit	3	0	0	3	40	60	100
2	13040402	Electromagnetic Theory	3	0	0	3	40	60	100
3	13040403	Analog Communication	3	0	0	3	40	60	100
4	13040404	Interfacing with µP & µC	3	0	0	3	40	60	100
5	13040405	Numerical Method	3	1	0	4	40	60	100
6		VA Course-I	2	0	0	0	40	60	100
7	13040409	Integrated Circuit Lab	0	0	2	1	20	30	50
8	13040410	Analog Communication Lab	0	0	2	1	20	30	50
9	13040411	Interfacing with µP & µC Lab	0	0	2	1	20	30	50
10	13040413	Major Project phase- I	0	0	4	2	20	30	50
Total Contact Hours			**17**	**1**	**10**	**21**	**320**	**480**	**800**
			28						

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CURRICULUM- 2019-2020
B. Tech. -ECE– V Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1	13040501	Antenna Wave propagation	3	0	0	3	40	60	100
2	13040502	Digital Communication	3	0	0	3	40	60	100
3	13040503	DSP with simulation	3	0	0	3	40	60	100
4		Program Elective-I	3	0	0	3	40	60	100
6		Open Elective -I	3	0	0	3	40	60	100
7	13040514	Essence of Indian knowledge Traditional	2	0	0	0	40	60	100
8	13040517	Antenna Design & Simulation Lab	0	0	2	1	20	30	50
9	13040518	Digital Communication Lab	0	0	2	1	20	30	50
10	13040519	DSP with Simulation	0	0	2	1	20	30	50
11	13040520	Manor Project phase -II	0	0	2	1	20	30	50
12	13040521	Industrial Training-II	0	0	0	1	20	30	50
13	13040522	General Lab -I	0	0	2	1	20	30	50
Total			**17**	**0**	**10**	**21**	**360**	**540**	**900**
			27						

Program Elective 1:	
13040504	Instrumentation & Measurement
13040505	Embedded system
13040506	Power Electronics
13040507	Sensor & Architecture Interfacing

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CURRICULUM- 2019-2020
B. Tech. –ECE- VI Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
5		Microwave & Radar	3	0	0	3	40	60	100
6		VLSI Design	3	0	0	3	40	60	100
7		Program Elective-II	3	0	0	3	40	60	100
8		Program Elective-III	3	0	0	3	40	60	100
5		Open Elective- II	3	0	0	3	40	60	100
6		VA Course-II	2	0	0	0	40	60	100
7		Microwave & Radar Lab	0	0	2	1	20	30	50
8		VLSI Design Lab	0	0	2	1	20	30	50
9		Major Project phase -II	0	0	4	2	20	30	50
10		GL-II	0	0	2	1	20	30	50
11		GL-III	0	0	2	1	20	30	50
Total			**17**	**0**	**12**	**21**	**340**	**510**	850
			29						

Program Elective II		**Program Elective III**	
	Bio-Medical Instrumentation		Control System
	Digital Processor		ARM Processor
	Scientific Computing		Speech processing & Recognition
	Information Theory & Coding		Wireless sensor Network
			DSD with programmable logic

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CURRICULUM- 2019-2020
B. Tech. -ECE– VII Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1		Wireless Communication	3	0	0	3	40	60	100

2		Program Elective-IV	3	0	0	3	40	60	100
3		Open Elective III	3	0	0	3	40	60	100
4		Open Elective IV	3	0	0	3	40	60	100
5		Professional Ethics for Electronics Engineers	2	0	0	2	40	60	100
6		Review Article Phase-I	0	0	6	3	20	30	50
7		Wireless Communication Lab	0	0	2	1	20	30	50
9		Industrial Training – III	0	0	0	1	20	30	50
10		GL-IV	0	0	2	1	20	30	50
Total Contact Hours			**14**	**0**	**10**	**20**	**280**	**420**	700
			24						

Program Elective-IV	
	Computational Electromagnetic
	DIP with simulation
	IoT Architecture
	RF VLSI

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CURRICULUM- 2019-2020
B. Tech. -ECE– VIII Semester

Sr. No.	**Subject Code**	**Course title**	**Schedule**				**Mark**		
			L	**T**	**P**	**C**	**Int.**	**Ext.**	**Total**
1		Program Elective-V	3	0	0	3	40	60	100

2		Program Elective-VI	3	0	0	3	40	60	100
3		Review Article phase-II	0	0	6	3	20	30	50
4		General Lab-V	0	0	2	1	20	30	50
5		General Lab-VI	0	0	2	1	20	30	50
Total Contact Hours			**6**	**0**	**10**	**11**	**140**	**210**	350
			16						

Program Elective-V	
	Microwave in MIC's
	Optical Communication
	Arduino Programming & Introduction to Raspberry Pi
	Verilog Programming

Program Elective-VI	
	Satellite communication
	RF component Design: Simulator Approved
	Modern Comm. Technologies
	High Speed Electronics

1.	**Name of the Department- B.Tech 1st Year**							
2.	**Course Name**	**Engineering Mathematics - I**		**L**	**T**		**P**	
3.	**Course Code**	CE,ME,ECE	3		1		0	
4.	**Type of Course (use tick mark)**		**Core ()**	**BSC (✓)**	**PE()**		**OE()**	
5.	**Pre-requisite (if any)**	**Mathematics at +2 Level**	**6. Frequency (use tick marks)**		Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 42	**Tutorials = 14**	**Practical = 0**

8. Brief Syllabus

The purpose of this module is to provide participants with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of calculus, vector analysis and infinite series. The subject aims to show the relevance of mathematics to engineering and applied sciences. This module also facilitates articulation to Degree courses in all streams of Engineering and forms a basis for more specialist branches of mathematics.

9. Learning objectives:

The goal of the Engineering Math sequence is to master the basic tools for the study of science, business and engineering and become skilled in its use for solving problems in science and engineering.

10. Course Outcomes (COs):

i) To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.

ii) The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

iii) The tool of power series and Fourier series for learning advanced Engineering Mathematics.

iv) To deal with functions of several variables that are essential in most branches of engineering.

v) The essential tool of matrices and linear algebra in a comprehensive manner.

11. Unit wise detailed content

Unit-1	**Number of lectures = 06**	**Calculus**
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.		
Unit – 2	**Number of lectures = 06**	**Calculus**
Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L Hospital's rule; Maxima and minima.		
Unit - 3	**Number of lectures = 10**	**Sequences and series**
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.		
Unit - 4	**Number of lectures = 08**	**Multivariable Calculus (Differentiation)**
Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence		
Unit - 5	**Number of lectures = 10**	**Matrices**
Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skewsymmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010

Reference Books:

- G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,

2002.
- Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
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1.	**Name of the Department**: B.Tech. 1st Year					
2.	**Course Name**	Engineering Physics		**L**	**T**	**P**
3.	**Course Code**			3	1	0
4.	**Type of Course (use tick mark)**	**Core (√)**	**DSE ()**	**AEC ()**	**SEC ()**	**OE ()**
5.	**Pre-requisite (if any)**	Intermediate courses	**6. Frequency (use tick marks)**	Even (√)	Odd (√)	Either Sem ()	Every Sem ()
7.	**Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)**					
Lectures = 42		**Tutorials = 14**		**Practical = 0**		

8. Course Description:

Engineering physics course provide an opportunity to students to learn fundamental concepts of physics and apply these concepts in today's rapidly changing and highly technical/engineering environment. This course also emphasizes the solid foundations of modern scientific principles.

9. Course Objectives:

i) To give students a basic exposure to Physics that will better prepare them for more rigorous courses that will be taken later on.

ii)To make students learn and understand basic concepts and principles of physics to analyze practical engineering problems and apply its solutions effectively and meaningfully.

10. Course Outcomes (COs):

At the completion of this course, students will be able to:

i) Describe the behavior of and make predictions regarding the phenomena of the physical world.

ii) Apply fundamental principles of physics to solve problems relating to waves, crystal structure, band theory of solids, quantum physics and special theory of relativity.

iii)Understand the importance of record-keeping and have practiced its use during labs and/or lectures.

11. Unit wise detailed content

Unit-1	**Number of lectures = 13**	**Title of the unit: Wave Optics**

Interference: Coherent sources, conditions for sustained interference. Division of Wave-Front - Fresnel's Biprism, Division of Amplitude- Newton's Rings, applications.

Diffraction: Difference between interference and diffraction, Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Plane transmission diffraction grating, dispersive power and resolving power of grating.

Polarization: Polarized and unpolarised light, uniaxial crystal, double refraction, Nicol prism, Quarter and Half wave plates, Detection and production of different types of polarized light.

Unit - 2	**Number of lectures = 13**	**Crystal Structure and Band theory of solids**

Crystal Structure: Space lattice, unit cell and translation vector, Miller indices, simple crystal structure, Bragg's law, defect in solids.

Free Electron Theory: Elements of classical free electron theory and its limitations. Drude's theory of conduction, quantum theory of free electrons, Fermi level, density of states, Fermi-Dirac distribution function.

Band Theory of solids: Origin of energy bands, Kroning-Penney model ,E-K diagrams, Brillouin zones, Concept of effective mass and holes, Classification of solids into metals, semiconductors and insulators, Hall effect and its applications.

Unit - 3	**Number of lectures = 13**	**Special Theory of RelativityLaser and Quantum Physics**

Special Theory of Relativity: Postulates of special theory of relativity, Lorentz transformations. Consequences of LT (length contraction and time dilation). Variation of mass with velocity, Mass energy equivalence.

Quantum Physics: Inadequacies of classical physics, introduction to quantum mechanics-simple concepts,

Black body radiations Discovery of Planck's constant, wave particle duality, phase velocity and group velocity. Schrodinger wave equations-time dependent and time independent, Expectation value, particle in a one-dimensional box.

Unit - 4	Number of lectures = 13	Title of the unit: LASER and Electromagnetic theory

LASER: Spontaneous and Stimulated emission, characteristics of laser beam, principle of laser, lasing action, three level laser, four level laser, He-Ne laser, applications.

Fiber Optics: Propagation of light in optical fibers, numerical aperture, V-number, single and multimode fibers, attenuation, dispersion,applications**.**

Electromagnetic theory: Gradient, divergence and curl, stokes theorem, gauss- divergence theorem, gauss law, faraday law, ampere circuital law, displacement current, Maxwell's equation.

12. Brief Description of self-learning / E-learning component

To understand basic concepts in detail, students may get study materials on following links.
https://onlinecourses.nptel.ac.in/noc18_ph02
https://ocw.mit.edu/courses/physics/

13. Books Recommended

Text Books:

- Modern Physics for Engineers – S.P.Taneja (R. Chand)

Reference Books:

- Engineering Physics – SatyaPrakash (PragatiPrakashan)
- Modern Engineering Physics – A.S.Vasudeva (S. Chand)
- Perspectives of Modern Physics - Arthur Beiser (TMH)
- Optics - AjoyGhatak (TMH)
- Fundamentals of Physics – Resnick & Halliday (Asian Book)
- Introduction to Electrodynamics- David J. Griffiths (PEARSON)

1. Name of the Department: B.Tech. 1st Year						
2. Course Name	Engineering Physics Lab	**L**	**T**		**P**	
3. Course Code		0	0		2	
4. Type of Course (use tick mark)		**Core (√)**	**DSE ()**	**AEC ()**	**SEC ()**	**OE ()**
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (√)	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 28**			

8. Course Description:

Experiments include the fundamental of interference, diffraction, polarization of light, calculation of e/m ratio by different methods, study of characteristics of a p-n diode and solar cell.

9. Course Objectives:

i) To impart practical knowledge about some of the phenomena they have studied in the Engineering Physics course like interference, diffraction and polarization.
ii) To develop the experimental skills of the students and
iii) To implement them into practically working equipment which are helpful in our daily life.

10. Course Outcomes (COs):

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

i) Apply the concepts of basic optical devices to design various equipment.
ii) Understand operation of Carey Fosterbridge, solar cell, p-n diode etc.
iii) Apply the concepts of electricity and magnetism to design various equipment.
iv) **Analyze electronic circuits design for various practical applications**

11. List of Experiments

1. To find the wavelength of sodium light by Newton's rings experiment.
2. To find the wavelength of various colors of white light with the help of a plane transmission diffraction grating.
3. To find the wavelength of a He-Ne laser beam.
4. To study the photo conducting cell and hence to verify the inverse square law.
5. To find the low resistance by Carey- Foster's bridge.
6. To study the characteristics of a solar cell and to find the fill factor.
7. To find the value of e/m for electrons by helical method.
8. To find the ionization potential of Argon/Mercury using a thyratron tube.
9. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
10. To study the V-I characteristics of a p-n diode.
11. To find the value of e/m for electrons by Thomson method.
12. To calculate the value of 'g' using bar pendulum.
13. Measurement of Specific rotation of sugar solution using polarimeter.

14. To determine value of Boltzmann constant using V-I characteristic of PN diode.

12. Book Recommended

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta&V.Kumar (PragatiPrakashan).
3. Advanced Practical Physics Vol.I& II – Chauhan & Singh (PragatiPrakashan)

1. Name of the Department: B.Tech 1st Year

2.	**Course Name**	Basic of Electronics Engineering	**L**	**T**		**P**
3.	**Course Code**		3	0		0
4.	**Type of Course (use tick mark)**	**Core (✓)**	**PE()**		**OE()**	
5.	**Pre-requisite (if any)**	Physics and Mathematics at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)

Lectures = 42	**Tutorials = 0**	**Practical = 0**

8. Brief Syllabus

The course intends to introduce students to the fundamental concepts of Analog and Digital electronics. The physical structure, working principle and characteristics of widely used components such as diodes, transistors and measuring instruments such as voltmeter, ammeter and oscilloscopes is covered. The working theory of basic digital components such as logic gates and flip flops is also included.

9. Learning objectives:

- To explain the origins of semiconductor device physics.
- To explain the physical structure and I-V characteristics of the standard p-n junction diode and other special types of diodes.
- To explain the construction and working principle of meters and displays.
- To explain the application of logic gates and flip flops.

10. Course Outcomes (COs):

On completion of this course, the student should be able to:

- Explain the structure and working of various types of diodes.
- Demonstrate the different applications of diodes and transistors.
- Explain the working principle and limitations of various measuring instruments.
- Explain the process of minimizing Boolean functions & differentiate between different types of Flip Flops.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Semiconductor Physics**

P-N junction diode: theory, depletion region, biasing, I-V characteristics, temperature dependence, equivalent circuit and capacitance.
Construction, Working principle and I-V characteristics of Zener diode, Photodiode, LED, Schottky diode, Tunnel diode and Varactor diode.

Unit - 2	**Number of lectures = 11**	**Application of Diodes and Transistor Basics**

Application of Diodes: Rectifiers (types and performance), Clippers & Clampers (series, parallel and

biased), Voltage Regulators.
Transistor Basics: Schematic Diagrams and Working of Bipolar Junction Transistors (BJT), Configuration of BJT, UJT, Fundamentals of JFET and MOSFET.

Unit - 3	**Number of lectures = 11**	**Instrumentation & Digital Electronics**

Instrumentation: Construction & Operation of Voltmeter, Ammeter, Multimeter, CRT, CRO, DSO, Function Generator and Regulated Power Supply.
Digital Electronics: Logic gates, Realization of Logic operations using Universal Gates, Application of Boolean Laws in Minimizing logic functions, Number Systems and their inter conversion, Flip Flops (S-R, J-K, D and T).

Unit - 4	**Number of lectures = 10**	**Fundamentals Of Communication System**

Block Diagram of Communication System, Classification of signals-Periodic & Non-periodic, even & odd, deterministic & random, exponential/sinusoidal, representation of unit step, unit impulse & unit ramp function, reversal, time shifting, time scaling.

12. Brief Description of self-learning / E-learning component

The students can utilize following resources for further learning and practice
http://nptel.ac.in/courses/117103063/
https://www.circuitglobe.com

13. Books Recommended (3 Text Books + 2-3 Reference Books)

Text Books:

- Robert L. Boylestad & Louis Nashelsky "Electronic Devices and Circuit Theory", 10th Ed. Pearson Education

Reference Books:

- Basics of Electronics Engineering, Vijay Baru*et. al.*, Wiley India Private Limited.
- Electronic Fundamentals and Application, J. D. Ryder, Prentice Hall India.
- Electronic Instrumentation, H. S. Kalsi, Tata McGraw Hills India, 3rd Edition.
- Integrated Electronics, Millman & Halkias, Tata McGraw Hills India, 2007.

1.	**Name of the Department: B.Tech (1st Year)**						
2.	**Course Name**	Basics of Electronics Lab	**L (0)**	**T(0)**		**P (2)**	
3.	**Course Code**						
4.	**Type of Course (use tick mark)**		**Core (✓)**	**PE()**		**OE()**	
5.	**Pre-requisite (if any)**	Physics and Mathematics at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7.	**Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)**						
Lectures = 00			**Tutorials = 00**			**Practical = 28**	

8. Brief Syllabus

The course intends to introduce students to the fundamental concepts of Analog and Digital electronics. The physical structure, working principle and characteristics of widely used components such as diodes, transistors and measuring instruments such as voltmeter, ammeter and oscilloscopes working and applications. The working theory of basic digital components such as logic gates and flip flops is also included.

9. Learning objectives:

- To study the I-V characteristics and other parameters of different types of diodes.
- To study the construction and working principle of different measuring instrument and displays.
- To study the application of logic gates and flip flops.

10. Course Outcomes (COs):

On completion of this course, the student should be able to:

- Use various types of diodes for Industrial applications.
- Use various measuring instruments.
- Explain the process of minimizing Boolean functions & differentiate between different types of Flip Flops.

11. Lab Experiment

Sr. No.	Title	CO covered
1	To study the I-V characteristics of a p-n junction diode.	
2	To study the application of a Zener diode as a voltage regulator.	
3	To study the working of a Light Emitting Diode.	
4	To study the application of a diode as a rectifier.	

5	To study the application of a diode as a clipper and a clamper	
6	To study the working of a CRO and a DSO.	
7	To study the working of a Function Generator.	
8	To study the working of a Regulated Power Supply.	
9	To study different types of logic gates.	
10	To study the application of NOR & NAND gates as Universal logic gates.	
11	To study the working of different Flip Flops (S-R, J-K, D and T)	
12	To study the I-V characteristics of a bipolar junction transistor in CB & CC configuration.	

1. Name of the Department: B.Tech (1st Year)						
2. Course Name	Fundamentals of Computer Programming		**L (3)**	**T (0)**	**P (0)**	
3. Course Code						
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Basic Knowledge of Computers	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

The course has introduction to computer, operating system and computer networks. C Programming language is included in the course.

9. Learning objectives:

- To be able to develop the programs using C programming language.
- To prepare the flow chart for any logical kind of problem.

10. Course Outcomes (COs): At the completion of this course, students will be able to:

- Troubleshoot computer hardware and software.
- Develop live software projects using C programming languages

11. Unit wise detailed content

Unit-1	**Number of lectures = 11**	**Introduction to Computer System**

An introduction of Computer System: Introduction of Computer, Evaluation of Computers, Different Units of Computer System, Processor, Memory- Primary, Secondary; Input-Output Devices; Storage Devices. Number system and Conversions- Binary, Octal, Decimal, Hexa decimal.

Basic Introduction to System Software and Programs: Machine Language, Assembly Language, Low level languages, High level Languages, Types of high level languages, Complier, Interpreter, Assembler, Loader, Linker.

Unit - 2	**Number of lectures = 10**	**Computer programming/Networks**

Operating System Basics : Introduction to Operating system, Functions of an Operating system, Classification of Operating Systems,

Basic concepts of Computer Networks: Computer Networks concepts, Network Topologies, Types of Networks: LAN, MAN and WAN, OSI Reference model, Introduction to TCP/ IP Reference model.

Unit - 3	**Number of lectures = 10**	**C Language: Basic**

Basics of 'C' Language: C Fundamentals, Program formats, header file, Basic data types, local and external

variables and scope, operators, expressions, decision control structure, selection statements, loops control; case controls; Arrays and Strings.

Unit - 4	**Number of lectures = 11**	**C Language: Advanced**

Advanced features of C Language: Functions, Parameter passing in functions, call by value, call by reference, Passing arrays to functions, Recursive functions, Defining structures, declaring variables, Accessing structure members, structure initialization, unions, Accessing union members. Idea of pointers, use of pointers.

12. Brief Description of self-learning / E-learning component

13. Books Recommended (1 Text Books + 3 Reference Books)

Text Books:

- Fundamentals of Computers by P.K. Sinha, BPB Publications Reprint Edition, 2018

Reference Books:

- Let Us C by Yashwant Kanetkar , BPB Publications.16th Edition 2017

1. Name of the Department: B.Tech (1st Year)

2. Course Name	Fundamentals of Computer Programming Lab	**L**	**T**	**P**
3. Course Code		0	0	2

4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Basic Knowledge of Computers	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)

Lectures = 0	**Tutorials = 0**	**Practical = 28**

8. Brief Syllabus

The course has introduction to computer, operating system and computer networks and how to troubleshoot computer hardware and software. This also includes programs in C language.

9. Learning objectives:

- To be able to develop the programs using C programming language.
- To prepare the flow chart for any logical kind of problem.

10. Course Outcomes (COs):

At the completion of this course, students will be able to:

- Design programs using C language.
- Develop live software projects using C programming languages

11. Detailed content

1. Assembly and disassembly of a Desktop Computer with connections.
2. Operating System Installation-Formatting, Partitioning
3. Additional Hardware Installation like printer, mobile, scanner.
4. Application Software Installation-MS Office and CD/DVD Writing
5. To connect two PC's using the interconnecting devices and transfer the data between them.
6. To study various connections and ports used in computer communication. PS/2 port and its specification, VGA Port and its specification, Serial port and its specification and applications, Parallel Ports and its specification, USB Port and its specification, RJ45 connector, DVI Monitor port.
7. To study various cards used in a Computer System. (Ethernet Card, Sound Card, Video/Graphics Card, Network Interface card ,TV Tuner Card, Accelerator card)
8. Write a C program to print a message
9. Write a program to find the largest of three numbers. (if-then-else)
10. Write a program to find the largest number out of ten numbers (for-statement)
11. Write a program to find a number is even or odd
12. Write a program to find a number is prime or not

13. Write a program using arrays to find the largest and second largest no. out of given 50 nos.
14. Write a program to find sum of 2 matrices
15. Write a program to find multiplication of 2 matrices
16. Write a program to find factorial of a number using function
17. Write a program to check that the input string is a palindrome or not.
18. Write a program to implement concept of while and do while loop
19. Write a program to print a pattern
20. Write a program which manipulates structures (write, read, and update records).

1. Name of the Department: B.Tech. (1st Year)				
2. Course Name	**Engineering Graphics and Design**	**L**	**T**	**P**
3. Course Code		1	0	0

4. Type of Course (use tick mark)	**Core ()**	**EAS (✓)**	**PE()**	**OE()**	
5. Pre-requisite (if any)	**Geometry and Drawing at +2 Level**	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	EverySem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures =14	**Tutorials = 0**	**Practical = 0**

8. Brief Syllabus

Engineering Drawing is considered as language of engineers. This course is thus introduced to provide basic understanding of fundamentals of engineering drawing, visualization, standards and conventions of drawing, the tools of drawing and use of drawing in engineering applications. The topics are covered in a sequence and starts from the basic concepts of geometrical constructions and progress to the principles of projection techniques in engineering drawing. Towards the end of the course it is expected that students would be matured to visualize the engineering components from any drawing sheet, followed by the projection techniques. A number of chosen problems will be solved to illustrate the concepts clearly.

9. Learning objectives:

i) To understand the basic concepts of drawing and projection techniques.
ii) To enhance the knowledge of reading the layouts.
iii) To develop engineering imagination which is essential for creation of successful designs.

10. Course Outcomes (COs):

i) Clarity in Drawing
ii) Can read shop layout and industrial layouts
iii) Design any layout by using projection techniques.
iv) Basic knowledge about CAD.

11. Unit wise detailed content

Unit-1	**Number of lectures = 2**	**Title of the unit:Introduction to Drawing**

Introduction and importance of engineering drawing, drawing instruments, drawing standards and conventions. Geometrical constructions and scales. Lettering, Classification of lines. Sheet layouts.

Unit – 2	Number of lectures = 3	Title of the unit: Principle of Projection
Principles of Orthographic Projections. Methods of projection: 1st angle and 3rd angle projections with conventions. Projection of points: including Points in all four quadrants. Projection of lines: Parallel, perpendicular inclined to one plan and inclined to both planes. True length and true angle of a line. Traces of a line. Projection of plains: Plane parallel, perpendicular and inclined to one reference plane. Plane inclined to both the reference planes. Traces of plane.		
Unit – 3	**Number of lectures = 3**	**Title of the unit: Projection of solids**
Types of solids. Projection of solids like cylinder, cone, prisms, pyramid with axes parallel, perpendicular and inclined to both reference planes. Projections of regular solids, cube, prisms, pyramids, tetrahedron, cylinder and cone, axis inclined to both planes. **Sections and Sectional Views:** Right Regular Solids – Prism, Cylinder, Pyramid, Cone – use of Auxiliary views.		
Unit – 4	**Number of lectures = 3**	**Title of the unit: Development of surfaces**
Definitions and significance. Methods of development. Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramids, Cone and their parts. Frustum of solids.		
Unit – 5	**Number of lectures = 3**	**Isometric and perspective projection**
Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. **Perspective Projections:** Perspective View, Points, Lines and Plane Figures, Vanishing Point Methods		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/

13. Books Recommended

Text Book:

1. Engineering Drawing plane and solid geometry: N D Bhatt and V M Panchal, Charotar publishing House, 53rd Edition 2014 edition, ISBN-10: 9380358962

Reference Books:

1. Engineering Drawing by K.VenuGopal&V.Prabu Raja New Age Publications. 2009, ISBN 8122421091
2. Engineering Drawing by John. PHI Learning Publisher, ISBN: 978812033788

1. Name of the Department: B.Tech. (1st Year)							
2. Course Name	**Engineering Graphics and Design Lab**	**L (0)**		**T (0)**		**P (4)**	
3. Course Code							
4. Type of Course (use tick mark)		**Core ()**	**EAS (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Geometry and Drawing at +2 Level**	**6. Frequency (use tick marks)**		Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures =0		**Tutorials = 0**		**Practical = 56**			

8. Brief Syllabus

Engineering Drawing is considered as language of engineers. This course is thus introduced to provide basic understanding of fundamentals of engineering drawing, visualization, standards and conventions of drawing, the tools of drawing and use of drawing in engineering applications. The topics are covered in a sequence and starts from the basic concepts of geometrical constructions and progress to the principles of projection techniques in engineering drawing. Towards the end of the course it is expected that students would be matured to visualize the engineering components from any drawing sheet, followed by the projection techniques. A number of chosen problems will be solved to illustrate the concepts clearly.

9. Learning objectives:

i) To understand the basic concepts of drawing and projection techniques.
ii) To enhance the knowledge of reading the layouts.
iii) To develop engineering imagination which is essential for creation of successful designs.

10. Course Outcomes (COs):

i. Clarity in Drawing
ii. Can read shop layout and industrial layouts
iii. Design any layout by using projection techniques.

11. Unit wise detailed content

Sr. No.	Title	CO Covered
1	Different types of lines with illustration and application.	
2	Draw sheet layout with dimensioning and lettering.	

3	Projection of points in four quadrants.	
4	Draw conventions of first angle and third angle projection method.	
5	Projection of straight lines in parallel, perpendicular and inclined planes.	
6	Projection of plane in perpendicular positions.	
7	Projection of cones and solid cylinders with axes parallel, perpendicular and inclined to both reference planes.	
8	Projection of prisms and pyramid.	
10	Draw Orthographic projection of simple machine elements.	
11	Draw Isometric projection of simple machine elements.	

1. Name of the Department- B.Tech 1st Year							
2. Course Name	**Engineering Lab**	**L (0)**		**T (0)**		**P (4)**	
3. Course Code							
4. Type of Course (use tick mark)		**Core ()**	**EAS (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Physics at +2 Level**	**6. Frequency (use tick marks)**		Even ()	Odd ()	Either Sem ()	Every Sem()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures =0		**Tutorials = 0**		**Practical = 56**			

8. Brief Syllabus

Students belonging to all branches of Engineering are made to learn certain fundamental topics related to civil engineering so that they will have basic understanding of the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, airports, sewerage systems, pipelines, structural components of buildings, and railways.andcertain fundamental topics related to mechanical engineeringso that they will have a minimum understanding of mechanical systems, equipment and process.

9. Learning objectives:

i) To understand the fundamentals ofbasic environment related aspects by use of civil engineering.

ii) To understand the fundamentals of mechanical systems and material testing.

iii) To understand and appreciate significance of civil and mechanical engineering in different fields of engineering.

10. Course Outcomes (COs):

i) Understand about the working, functions and applications of equipments used in daily life.

ii) Understand the aspects ofenvironment; sources of water, water quality, supply and treatment of water; roads, traffic regulations and structural design.

iii) Understand the basic knowledge of Civil engineering components, general day to day involvement of civil engineering in life. Also understand importance of Civil engineering in solving environment and other problems.

iv) Identify the broad context of Mechanical engineering problems, including describing the problem conditions and identifying possible contributing factors

v) Understand the fundamental elements of Mechanical engineering systems, system components and processes, with a good understanding of associated safety, quality, schedule and cost considerations.

11. Books Recommended

i) Elements of Mechanical Engineering, S.M. Bhatt, H.G. Katariya, Books India publication

ii) Introduction to Civil Engineering Systems: A Systems Perspective to the Development of Civil Engineering Facilities 1st Edition.

iii) Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi

iv) Thermal Science and Engineering by Dr. D.S. Kumar, S.K. Kataria& sons, Publication New Delhi

v) Elements of Mechanical Engineering, Desai &Soni , AtulPrakashan

12. Lab components

Sr. No.	**Title**	**CO covered**
1	**(Part I)Machine Studies:** To study the Cochran and Babcock & Wilcox boilers.	
2	To study the working and function of mountings and accessories inboilers.	
3	To study various types of Internal Combustion Engines.	

4	To study various types of gears and gear boxes.	
5	To study various types of Transmission systems.	
6	To study functioning of Hybrid Vehicles / Electric Vehicles.	
7	To study Psychometric chart.	
8	To Study the vapor compression Refrigeration System and determination of its C.O.P.	
9	To study the functioning of Window Room Air Conditioner.	
10	To study various vapor power cycles.	
11	To study various air standard cycles.	
12	To study the constructional features and working of different types of Hydraulic machines.	
13	Determine Mechanical Advantage, Velocity Ratio and Efficiency of Single Start, Double Start and Triple Start Worm & Worm Wheel.	
14	Determine Mechanical Advantage, Velocity Ratio and Efficiency of Single purchase and Double purchase winch crab.	

(Part II) Basic Studies in Civil engineering:

Sr. No	**Title**	**CO covered**
1	Determination of pH value of given water samples.	
2	Determination of total Dissolved solid in a given water sample.	
3	Measurement of environmental noise by noise level meter.	
4	To conduct a study on rock formation and rock cycle.	
5	To conduct a study on interior of earth on the basis of seismic model.	
6	To conduct a study on Aquifers, groundwater and permeability of soils.	
7	To study the concept of Meta-centric height of a body.	
8	Conducting experiments to verify Bernoulli's theorem.	
9	To study the properties of fluid flow.	
10	To study the physical properties of soil.	
11	To study the photogrammetric surveying.	
12	To study the geometric design of highway.	
13	To study the Traffic Regulations and Management.	
14	To study the different elements of building structure.	
15	To conduct the study on air quality index of ambient atmosphere.	
16	To study various discharge measuring devices.	

1. Name of the Department: B.Tech. 1st Year							
2. Course Name	**Engineering Mathematics - II**	**L (3)**		**T (1)**		**P (0)**	
3. Course Code	ME,CE,ECE						
4. Type of Course (use tick mark)		**Core ()**	**BSC (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Engineering Mathematics - I**	**6. Frequency (use tick marks)**		Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures = 42		**Tutorials = 14**		**Practical = 0**			

8. Brief Syllabus

The purpose of this module is to provide participants with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of, calculus,complex variables and differential equation. The subject aims to show the relevance of mathematics to engineering and applied sciences. This module also facilitates articulation to Degree courses in all streams of Engineering and forms a basis for more specialist branches of mathematics.

9. Learning objectives:

The goal of the Engineering Math sequence is to master the basic tools for the study of science, business and engineering and become skilled in its use for solving problems in science and engineering.

10. Course Outcomes (COs):

i) Upon completion of this course, students will be able to solve field problems in engineering involving PDEs.

ii) They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Multivariable Calculus (Integration)**

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Unit - 2	**Number of lectures = 06**	**First order ordinary differential equations**

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Unit - 3	**Number of lectures = 08**	**Ordinary differential equations of higher orders**

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Unit - 4	**Number of lectures = 08**	**Complex Variable – Differentiation**

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

Unit - 5	**Number of lectures = 08**	**Title of the unit: Complex Variable – Integration**

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.The link to the E-Learning portal.https://elearning.sgtuniversity.ac.in/course-category/Journal papers; Patents in the respective field.

13. Books Recommended

i) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

ii) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

iii) P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

iv) S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

1. Name of the Department: B.Tech. (1st Year)						
2. Course Name	Industrial Chemistry	**L (3)**	**T (1)**		**P (0)**	
3. Course Code						
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Chemistry at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 14**	**Practical = 0**			

8. Brief Syllabus

This course intends to introduce students the basic concept of chemistry with atomic and molecular structures. The students will learn about the stereochemistry and organic principles involved in various reactions. They will also be made aware of different intermolecular forces, fuel/ water chemistry, corrosion phenomenon's and kinetics of reactions. The students will understand the spectroscopic techniques and its applications.

9. Learning objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of chemical kinetics, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- To impart the knowledge of stereo-chemistry and structural aspects useful for understanding reaction pathways.

10. Course Outcomes (COs):

The basic concepts included in this course will help the student to gain:

1. The knowledge of atomic, molecular and electronic changes, chemical interactions, band theory related to conductivity.
2. The required principles and concepts of chemical kinetics, corrosion and in understanding the problem of water and its treatments.
3. The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
4. The knowledge of structural analysis of molecules and reaction mechanisms.

11. Unit wise detailed content

Unit-1	**Number of lectures = 14**	**Title of the unit: Atomic, molecular structure&Periodic properties**

Schrodinger equation (Introduction). Forms of the hydrogen atom wave functions. Molecular Orbital theory and its applications in MO energy level diagrams of diatomic molecules (N_2, O_2 and F_2). Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal Field Theory (CFT): Salient Features of CFT-Crystal Field

Splitting of transition metal ion d-orbitals in Tetrahedral, Octahedral and square planar geometries and its applications. Band structure of solids and effect of doping on conductance.

Solid state chemistry: Radius ratio rule, Type of unit cell and Bragg's Law. Graphite as two dimensional solid and its conducting properties. Fullerene and its applications.

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, oxidation states, coordination numbers and molecular geometries.

Unit - 2	**Number of lectures = 8**	**Title of the unit: Stereochemistry & Organic Principles**

Representations of 3-dimensional structures, structural isomers and stereoisomers, configurations and

chirality, enantiomers, diastereomers, optical activity. Isomerism in transitional metal compounds. Inductive, mesomeric and hyperconjugative effects. Stability of reaction intermediates e.g. carbocation and free radicals. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Structure of medicinal drugs, Paracetamol and Aspirin

Unit - 3	**Number of lectures = 8**	**Intermolecular forces, Fuel Chemistry & Chemical Kinetics**

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Classification of fuels, Coal and Biogas. Octane number & Cetane number and their significance. Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Cell potentials, the Nernst equation and applications. Order and molecularity of reactions. Energy of activation. Order and molecularity of reactions, Zero order, first order and second order reactions.

Unit - 4	**Number of lectures = 8**	**Water Chemistry and Corrosion**

Hardness of water-Introduction. Causes of Hardness. Types of hardness: temporary and permanent. Expression and units of hardness. Measurement of hardness of water by EDTA method. Method of water softening (Lime Soda process & Zeolite process). Chemical treatment of water- Disinfection of water by chlorination and Ozonization. Demineralization. Desalination of water-Reverse osmosis.
Corrosion: Introduction and types of corrosion (dry and wet corrosion), protective measures against corrosion.

Unit - 5	**Number of lectures = 4**	**Spectroscopic techniques and applications**

Basic principles of spectroscopic methods and selection rules. Applications of UV-Vis, IR, ^{1}H &^{13}C Nuclear Magnetic resonance spectroscopy in the determination of structure of simple organic compounds. Introduction to Magnetic resonance imaging.

12. Brief Description of self-learning / E-learning component

This will involve the NPTEL and SWAYAM portal system for the holistic knowledge. Power Point Presentation will be used and assist in the pictorial based learning and enhance the knowledge in a planned way. Lecture series on the online platform will be beneficial for the students. Online assignment will be designated to students at large.

13. Books Recommended (5 Text Books + 3 Reference Books)

TEXT BOOKS:

- Advanced Inorganic Chemistry, by Cotton, F.A., Wilkinson G., Murrillo, C.A. and Bochmann, Wiley, ehichester, 1999.

REFERENCE BOOKS:

- March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
- Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
- Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
- Applied Chemistry (Latest ed.), By H.D. Gesser.

1. Name of the Department: B.Tech. (1st Year)							
2. Course Name	Industrial Chemistry Lab	**L (0)**	**T (0)**		**P (2)**		
3. Course Code							
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**		
5. Pre-requisite (if any)	Chemistry at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()	
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures = 0		**Tutorials = 0**	**Practical = 28**				

8. Brief Syllabus

This practical course intends to enhance thestudents' knowledge related to the basic concept of chemistry through experimentation. The students will learn about the chemicalphenomena'sand proper laboratory safetytechniques.This will help them in better understanding of the information obtained from different scientific instrumentations.

9. Learning objectives:

- To impart practical overview of common laboratory techniques including pH measurement, acid/base titrations, UV/Visible spectroscopy, conductometer and Viscometer.
- To provide exposure of the scientific techniques mentioned above, to have better knowledge of chemical phenomena.
- To engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately.
- Learn about how to maintain a detailed scientific notebook.

10. Course Outcomes (COs): The basic concepts included in this course will help:

1. Students to carry out scientific experiments as well as accurately record & analyze the results of such experiments.
2. Students will be skilled in handling of various scientific instruments.
3. Students will learn the different synthetic methodologies and chemical phenomena.

11. Laboratory Practical Details

1. Determination of surface tension of given liquid by drop number method.
2. Determine the viscosity of given liquid by using Ostwald's viscometer / Redwood viscometer.
3. Calculate the Rf value of given sample using Thin layer chromatography / Paper chromatography.
4. Removal of Ca^{2+} and Mg^{2+} hardness from given water sample using ion exchange column.
5. Determination of chloride content in given water sample.
6. Calculate the strength of strong acid by titrating it with strong base using conductometer.
7. To prepare the of urea formaldehyde and phenol formaldehyde resin.
8. To Prepare iodoform.
9. Calculate the saponification value / acid value of given oil sample.
10. Chemical analysis of two anions and two cations in given sample of salt.
11. To determine the total hardness of given water sample by EDTA method.
12. Study the adsorption phenomena using acetic acid and charcoal.

12. Brief Description of self-learning / E-learning component

This will involve the use of NPTEL and SWAYAM portal system. Power Point Presentation will be used and assist in the pictorial based learning and enhance the knowledge in a planned way.

13. Books Recommended (1 Text Books + 2 Reference Books)

TEXT BOOKS:

- Practical Chemistry by Dr. O.P Pandey, D. N. Bajpai, Dr. S. Giri, S Chand; Edition-2010.

REFERENCE BOOKS:

- Modern Textbook of Chemistry Practical by S. N. Lal, Swastik Publishers & Distributors (2007).
- Vogel's Quantitative Chemical Analysis, Pearson Education; 6 Edition (2009)

1. Name of the Department: B.Tech. (1st Year)						
2. Course Name	**Communication Skills**	**L (2)**	**T (0)**		**P (0)**	
3. Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE ()**	
5. Pre-requisite (if any)	English at +2 level	**6. Frequency (use tick marks)**	Even (√)	Odd (√)	Either Sem ()	Every Sem ()
7.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 28		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus:

Unit I: Effective Communication

Introduction to Communication: Types of Communication, Process of Communication
Barriers to Communication and ways to overcome the barriers to communication.

Unit II: Conversation Skills:

Greetings and introducing oneself, Framing questions and answers, Role play, Buying: asking details etc.
Word formation strategies, vocabulary building, One word substitution, Antonyms, Synonyms, Homophones, Homonyms

Unit III: Reading Comprehension and Pronunciation:

Simple narration and Stories, Simple Passages, Newspaper and articles clippings, Pronunciation: Syllable and Stress.
Sentences: Types , Tenses, Phrases and Clauses, Parts of speech. Formal grammatical categories, Articles, Prepositional phrases, Phrasal verbs

Unit IV: Listening and Reading Comprehension

Speeches, Interviews, audio-video clippings followed by exercises,
Types of Reading, Regular reading session: Newspaper, Articles, and Stories etc.
Speaking Skills Errors in use of grammatical categories, Practice of Skills for Reading and Writing Comprehension Using Text from selected Stories/ Newspapers and Handouts.

Unit V: Writing Comprehension:

Correct the sentences, Note Making, Letter Writing, Brief introduction to Types of Letter, Format of Letter, Précis Writing, Paragraph Writing, Report Writing, Difference between Report and Proposal

9. Learning objectives:

i) To enhance the communication skills in a effective manner
ii) To develop communication skills as well as positive personality traits
iii) To enhance usage of English vocabulary and grammar
iv) To make students competent in professional and technical communication

10.Course Outcomes (COs):

i) Able to communicate and expand the knowledge of communication.
ii) Able to communicate in English confidently.
iii) Able to improve pronunciation and accent.
iv) Able to improve listening and speaking skills
v) Able to improve reading and writing skills

11.Unit wise course details:

Unit-1	**Number of lectures = 5**	**Title of the unit: Effective Communication**
Introduction to Communication, Importance of Communication, Process of communication, Barriers to communication and ways to overcome the barriers to communication, Interviews clipping followed by exercises.		
Unit - 2	**Number of Lectures=5**	**Title of the unit: Conversation Skills**
Greetings and introducing oneself, Framing questions and answers, Role play, Buying: asking details etc. Word formation strategies, vocabulary building, One word substitution, Antonyms, Synonyms, Homophones, Homonyms		
Unit - 3	**Number of lectures = 6**	**Title of the unit: Reading Comprehension and**

		Pronunciation
Simple narration and stories, Simple Passages, Newspaper and articles clippings, Pronunciation: Syllable, Stress, Intonation and Modulation Sentences types, Tenses, Phrases and Clauses, Parts of speech, Formal grammatical categories, Articles, Prepositional phrases, Phrasal verbs		
Unit - 4	**Number of lectures = 6**	**Title of the unit: Listening and Reading Comprehension**
Introduction of Listening, Types of Listening, Difference between Listening & Hearing Speeches, audio-video clippings followed by exercises. Types of Reading, Regular reading session: Newspaper, Articles, and Stories etc. Speaking Skills Errors in use of grammatical categories, Practice of Skills for Listening and Reading		
Unit-5	**Number of lectures = 6**	**Title of the unit: Writing Comprehension**
Writing Comprehension Using Text from selected Stories/ Newspapers and Handouts. Correct the sentences, Note Making, Letter Writing, Brief introduction to Types of Letter, Format of Letter, Précis Writing, Paragraph Writing, Report Writing, Difference between Report and Proposal		
12. Brief Description of self learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal: https://elearning.sgtuniversity.ac.in/course-category/general/		
13. Books Recommended (3 Text Books + 2-3 Reference Books)		
i) **Improve your Writing**, V.N. Arora, Lakshmi Chandra, Oxford University Press, New Delhi 2014		
ii) **Fluency In English II**, Promodini Varma, Mukti Sanyal, OUP India 2006		
iii) **Communication Skills in English,** D. G. Saxena and Kuntal Tamang, Top Quark, 2011		
iv) **Complete Course in English**, Robert J. Dixson PHI Private Limited 2009		
v) **Effective Technical Communication** M Asharaf Rizvi Tata McGraw Hill Education Private Limited 2005		
vi) **English Grammar in Context**, R K Agnihotri and A L Khanna Ratna Sagar 1996		
vii) **Professional Communication**, Malti Agrawal Krishna Educational Publishers 2013		

1. Name of the Department: B.Tech. (1st Year)						
2. Course Name	**Communication Skills Lab**	**L (0)**	**T (0)**		**P (2)**	
3. Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	English at +2 level	**6. Frequency (use tick marks)**	Even (√)	Odd (√)	Either Sem ()	Every Sem ()
7.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 28**			

8.Brief Syllabus:

Module I:

Introduction to Words worth Level-1

Meeting People, My Family, Asking Questions, Colours around you, Holiday Gateways, Home Sweet Home, It's my Life, Food for Thought, Making Friends, Buying Things, At The Park, Who's This? Home Improvement, The Calendar, Time Gone By, Know your Planet, What Did you do? Going Places, Do's and Don'ts, Parts of the Body, Better than the Best, Leisure Time, A Look into The Future, How do you Feel?

Module II:

Introduction to Consonant Sounds, Sounds in the English Language, Vowel Sounds, Pronunciation and Voice Modulation, Pronunciation & Voice Modulation, Tenses, Apply for learning, Active Listening, News Report one, E-Mail Etiquette, Effective Writing

Module III :

Pronunciation, Intonation, Modulation, Consonant sounds, Syllable, Syllable Stress, Pronunciation Grammar (Adjective), Pronunciation Grammar(Prepositions), Pronunciation Grammar (Subject Verb Agreement), Pronunciation Grammar (The Simple Present Tense, Present Continuous Tense), Pronunciation Grammar (The Simple Past Tense), Pronunciation Grammar (The Simple Future Tense)

9. Learning objectives:

i) To enhance usage of English vocabulary and grammar

ii) To develop communication skills as well as positive personality traits

iii) To make students competent in professional and technical communication

10. Course Outcomes (COs):

i) Students will be able to improve their listening skills

ii) They will be able to communicate in English confidently.

iii) Their pronunciation and accent will be improved

iv) Their writing skills will be enhanced

v) Reading skills will be also improved.

11.Unit wise course details:

Module-1	**Number of practical =10**	**Title of the unit: Listening Comprehension**

Introduction to Words worth Level-1

Meeting People, My Family, Asking Questions, and Colours around you, Holiday Gateways, Home Sweet Home, It's my Life, Food for Thought, Making Friends, Buying Things, At The Park, Who's This? Home Improvement, The Calendar, Time Gone By, Know your Planet, What Did you do? Going Places, Do's and Don'ts, Parts of the Body, Better than the Best, Leisure Time, A Look into The Future, How do you Feel?

Module- 2	**Number of practical =4**	**Title of the unit: Conversation Skills**

Introduction to Consonant Sounds, Sounds in the English Language, Vowel Sounds, Pronunciation and Voice Modulation, Pronunciation & Voice Modulation, Tenses, Apply for learning, Active Listening, News Report one, E-Mail Etiquette, Effective Writing.

Module– 3	**Number of practical =10**	**Title of the unit: Reading Comprehension and Pronunciation**

Pronunciation, Intonation, Modulation, Consonant sounds, Vowel Sounds, Syllable, Syllable Stress, Pronunciation Grammar (Adjective), Pronunciation Grammar (Prepositions), Pronunciation Grammar (Subject Verb Agreement), Pronunciation Grammar (The Simple Present Tense, Present Continuous Tense), Pronunciation Grammar (The Simple Past Tense), Pronunciation Grammar(The Simple Future Tense)

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/general

13. Books Recommended (3 Text Books + 2-3 Reference Books)

i) **Words Worth** Communication Three Modules

ii) Spoken English with CD, Jayashree Balan, Tata McGraw Hill 2010

1. Name of the Department: B.Tech (1st Year)						
2. Course Name	Basic Electrical Engineering	**L (3)**	**T (0)**		**P (2)**	
3. Course Code						
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Physics and Mathematics at +2 or Equivalent Level	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

Electrical Technology is a field of engineering that deals with the study and applications of electrical laws and theorems in electrical and electronic systems. The course covers the analysis of basics of electrical engineering, electrical parameters measurement and introduction of electrical machines. Upon completion, students should be able to deal with the various devices and able to construct the circuits for given specification, also able to analyze and study construction and working of electrical machine using electrical basics.

9. Learning objectives:

This course gives an idea to students about analyzing and solving different electrical and electronic circuits by applying different laws and theorems. The objectives are:

- To prepare students to know the characteristics of different electrical circuits and devices.
- Explain the fundamental principles necessary for the analysis and design of electrical circuits and machines.

10. Course Outcomes (COs):

On completion of this course, the student should be able to:

- Understanding various theorems and applying them to solve different electrical circuits.
- Verifying the characteristics of DC machine, Induction Machine and Synchronous Machine.
- Identify different electrical devices, apply subject knowledge and solve electrical circuit and device problems.

11. Unit wise detailed content

Unit-1	**Number of lectures = 11**	**Title of the unit: DC Network Laws and Theorems**

D.C. Network Laws And Theorems: (a). Concepts of network, Active and passive elements, Ohm's law and its limitations, Kirchhoff's laws, Nodal and Loop methods of analysis, Star to Delta & Delta to Star transformation.

(b).Thevenin's theorem, Norton's theorem, Superposition theorem, maximum power transfer theorem, Millman's theorem.

Unit - 2	**Number of lectures = 9**	**Title of the unit: Single Phase AC Circuits**

Single Phase A.C. Circuits: (a). Sinusoidal signal, Instantaneous and peak values, RMS and average values, crest and peak factor, Concept of phase, representation-polar & rectangular, exponential and trigonometric forms, behaviors of R, L and C components in A. C. circuits.

(b). Series and parallel A.C. circuits, Concept of active and reactive power, power factor, series and parallel resonance, Q factor, cut-off frequencies and bandwidth.

Unit - 3	**Number of lectures = 12**	**Title of the unit: 3-Phase Circuits, Magnetic Circuits & Single Phase Transformers.**

Three Phase A.C. Circuits, Magnetic Circuits & Transformer: Three phase system and its necessity and advantages, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement by two Wattmeter method.

Magnetic Circuits: Magnetic Effects of Electric Current; Magnetization Characteristics; Electromagnetic, Induction and Self and Mutual Inductance; Hysteresis and Eddy Current Losses.

Introduction to different Electrical measuring Instruments i.e. Wattmeter, Ammeter, voltmeter and Energy meter

Single Phase Transformers: Construction, Ideal Transformer, Transformer under No-Load and Loading Conditions, Phasor diagram under different Load conditions, Equivalent Circuit of Transformer, O.C and S.C test on transformer, Voltage Regulation Efficiency of a transformer.

Unit - 4	**Number of lectures = 10**	**Title of the unit: DC Machines, 3-Phase induction Motor and Synchronous Machines**

DC machines: Construction, EMF Equation, Torque Equation, Circuit Model – Generating and Motoring Modes. Armature Reaction, Methods of Excitation, Characteristics of DC Motors, Speed Control of Shunt Motor (Field and Armature Control), DC Motor Starting, Application of DC Motors.

Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications

Synchronous Machines: Construction, Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor with applications.

12. Brief Description of self-learning / E-learning component

The students can utilize following resources for further learning and practice

http://nptel.ac.in/courses/108108076/

https://www.circuitglobe.com

13. Books Recommended (3 Text Books + 2-3 Reference Books)

TEXT BOOKS:

- Basic Electrical Engineering (2nd Edition), Kothari, TMH.

REFERENCE BOOKS:

- Basic Electrical Engineering", S N Singh; Prentice Hall International.
- Electrical and Electronics Technology, Edward Hughes; Pearson Education.
- Electrical technology, (Volume I, II), B L Theraja& A K Theraja, S. Chand & Company.
- Electric Machines, I.J. Nagrath and D.P. Kothari, Tata McGraw-Hill Publishing Company Limited.

1. Name of the Department: B.Tech (1st Year)						
2. Subject Name	Basic Electrical Engineering Lab	**L (0)**	**T (0)**		**P (2)**	
3. Subject Code						
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Physics at +12 Level	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 28**			

8. Brief Syllabus

Electrical Technology is a field of engineering that deals with the study and applications of electrical laws and theorems in electrical and electronic systems. The course covers the analysis of basics of electrical engineering, electrical parameters measurement and introduction of electrical machines. Upon completion, students should be able to perform the experiments based on various circuits and machines. Students able to construct the circuits for given specification, also able to determine the different parameters construction and working of electrical machine using electrical basics.

9. Learning objectives:

This course gives an idea to students about analyzing and solving different electrical and electronic circuits by applying different laws and theorems. The objectives are:

- To prepare students to know the characteristics of different electrical circuits and devices.
- Explain the fundamental principles necessary for the analysis & design of electrical circuits & machines.

10. Course Outcomes (COs):

On completion of this course, the student should be able to:

- Understanding various theorems and applying them to solve different electrical circuits.
- Verifying the characteristics of DC machine, Induction Machine and Synchronous Machine.
- Identify different electrical devices, apply subject knowledge and solve electrical circuit and device problems.

11. Tutorial / Extended Tutorial /presentation/Case study components:

List of Experiments:

1. To study and verify Kirchhoff's Voltage and Current Laws.

2. To study and verify Thevenin's theorem.

3. To study and verify Nortons's theorem.

4. To study and verify Superposition theorem.

5. To study and verify Maximum power transfer theorem.

6. To study frequency response of RLC series circuit and find out its quality factor and resonance frequency.

7. To study frequency response of RLC parallel circuit and find out its quality factor and resonance frequency.

8.	To study O.C and S.C tests on transformer.
9.	To study various type of measuring instruments meters.
10.	To perform direct load test of a transformer and plot efficiency v/s load characteristics.
11.	To perform direct load test of a DC shunt generator and plot load voltage v/s load current curve.
12.	To study the working of DC machines.

12. Brief Description of self-learning / E-learning component

The students can utilize following resources for further learning and practice

http://nptel.ac.in/courses/108108076/

https://www.circuitglobe.com

1. Name of the Department: B.Tech. (1st Year)							
2. Course Name	**Workshop Technology**	**L (1)**		**T (0)**		**P (0)**	
3. Course Code							
4. Type of Course (use tick mark)		**Core ()**	**EAS (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Physics at +2 Level**	**6. Frequency (use tick marks)**		Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures = 14		**Tutorials = 0**		**Practical = 0**			

8. Brief Syllabus:

Workshop technology lab deals with different processes by which component of a machine or equipments are made.The subject aims at imparting knowledge and skill components in the field of basic workshop technology. It deals with different hand and machine tools required for manufacturing simple metal components and articles.

9. Learning objectives:

i) As the need of hand on practice for the engineers this course has special weightage.

ii) To be industry ready a student must have the knowledge of various welding processes, should have knowledge about the foundry and various machine tools. So, this course fulfills all these needs.

10. Course Outcomes (COs): After the completion of the course, the student shall be able to

i)	Practice workshop safety rules effectively.
ii)	Acquire knowledge and use simple measuring and gauging instruments.
iii)	Acquire knowledge and use simple hand tools
iv)	Operate simple drilling machines for producing small holes
v)	Operate various machine tools for producing simple metal components and articles
vi)	Acquire knowledge and practice on foundry, forging and welding

11. Unit wise detailed content

Unit-1	**Number of lectures = 2**	**Title of the unit: Introduction**

Introduction to Manufacturing Processes and their Classification, automation in manufacturing**,** Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accidents, Methods of Safety, Electric Safety Measures, First Aid.

Unit - 2	**Number of lectures = 3**	**Title of the unit: Welding**

Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, TIG & MIG Welding, Welding Defects and Remedies, Soldering & Brazing, Comparisons among Welding, Brazing and Soldering.

Unit - 3	**Number of lectures = 3**	**Title of the unit: Cold and Hot Working**

Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining - Advantages and Limitations. Hot Working Processes: Introduction to Hot Working, Principles of Hot Working Processes, Forging, Rolling, Extrusion, WireDrawing.

Unit - 4	**Number of lectures = 3**	**Title of the unit: Introduction to Machine Tools**

Specifications and Uses of commonly used Machine Tools in a Workshop such as Lathe, Shaper, Planer, Milling, Drilling, Slotter, Introduction to Metal Cutting. Nomenclature of a Single Points Cutting Tool and Tool Wear, Mechanics of Chips Formation, Type of Chips, Use of Coolants in machining.

Unit - 5	**Number of lectures = 3**	**Title of the unit: Foundry**

Introduction to Casting Processes, Basic Steps in Casting Process, Pattern, Types of Patterns, Pattern allowances, Risers, Runners, Gates, Molding Sand and its composition, Sand Preparation, Molding Methods, Core Sands and Core Making, Core Assembly, Mold Assembly, Melting (Cupola) and Pouring, Fettling, Casting Defects and Remedies. Testing of Castings

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/

13. Books Recommended

Text Book:

1. Workshop Technology (Manufacturing Process) – S K Garg, Laxmi Publications; Fourth edition (2018), ISBN-10: 8131806979

Reference Books:

1. Process and Materials of Manufacture -- Lindberg, R.A. Prentice Hall of India, New Delhi, Fourth Edition, ISBN-10: 9788120306639
2. Principles of Manufacturing Materials and Processes - Campbell, J.S. - McGraw- Hill, New Edition, ISBN-10: 0070992525
3. Manufacturing Science - Amitabha Ghosh & Ashok Kumar Malik, - East-West Press, PEARSON India, Second Edition (2010), ISBN-10: 8176710636

1. Name of the Department: B.Tech. (1st Year)							
2. Course Name	**Workshop Technology Lab**	**L (0)**		**T (0)**		**P (4)**	
3. Course Code							
4. Type of Course (use tick mark)		**Core ()**	**EAS (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Physics at +2 Level**	**6. Frequency (use tick marks)**		Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures = 0		**Tutorials = 0**		**Practical = 56**			

8. Brief Syllabus:

Workshop technology deals with different processes by which component of a machine or equipments are made.The subject aims at imparting knowledge and skill components in the field of basic workshop technology. It deals with different hand and machine tools required for manufacturing simple metal components and articles.

9. Learning objectives:

i) As the need of hand on practice for the engineers this course has special weightage.

ii) To be industry ready a student must have the knowledge of various welding processes, should have knowledge about the foundry and various machine tools. So this course fulfills all these needs.

10. Course Outcomes (COs): After the completion of the course, the student shall be able to

i)	Practice workshop safety rules effectively.
ii)	Acquire knowledge and use simple measuring and gauging instruments.
iii)	Acquire knowledge and use simple hand tools
iv)	Operate simple drilling machines for producing small holes
v)	Operate various machine tools for producing simple metal components and articles
vi)	Acquire knowledge and practice on foundry, forging and welding

11. Lab components

S. No.	Title	CO Covered
1	To perform machining operations like turning, step turning, threading etc. on the Lathe.	v
2	To make slot on work piece by using Milling Machine.	iv
3	To prepare groves on work piece by using Shaper Machine.	v
4	To perform surface finishing operation on Surface Grinder.	iv, v
5	To perform drilling operations.	iv
6	To make cross lap joint.	iii, iv
7	To make butt join	i, ii, vi
8	To make Lap joint by using Electric Arc Welding.	i, ii, vi
9	To make butt joint by using Electric Arc Welding	i, ii, vi

1. Name of the Department: B.Tech. (1st Year)						
2. Course Name	Environment Science	**L (0)**	**T (0)**		**P (0)**	
3. Course Code						
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Basic knowledge of environment	**6. Frequency (use tick marks)**	Even (✓)	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical-0						
Lectures = 0		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

The course intends to introduce students the objective of environmental sciences and the importance of conservation of natural resources. The students will learn about the sources, effects and control measures of air, water, soil, noise, thermal pollution. They will also be made aware of global environmental issues. The students will understand the need of sustainable development, environment pacts, role of information technology in the environment. The students will be explained basic principles of green building and environmental remedial measures.

9. Learning objectives:

- To develop awareness about our environmental scenarios.
- To develop a concern about sustainable development through future strategies.

10. Course Outcomes (COs)

On completion of this course, the student should be able to:

- Understand about environment and its components and Problems associated with natural resources and their sustainable use.
- Sources of pollution in air, water and soil and Solid waste management and natural Disaster management.
- Understanding about environmental andsocial issues, ecosystems, biodiversity.
- Understanding of role of information technology to address environmental issues through human involvement.

11. Unit wise Detailed Content

Unit-1	**Number of lectures=0**	**Title of the unit: Multi-disciplinary Approaches of Environmental Sciences**

Definition and scope; Introduction, components of the environment, environment degradation; ecological balance; principles of environmental impact assessment. Need for public awareness on environmental issues.

Unit - 2	**Number of lectures=0**	**Title of the unit: Natural Resources**

Natural Resources: Classification of Resources; Renewable and non-renewable resources; Water resources: use and over utilization of surface and ground water, Role of Dams; Food Resources: Global food challenges, changes in agricultural ways, water logging, salinity; Mineral resources: use and over-exploitation; Land resources: Forest resources, man induces landslides, soil erosion, and desertification; Energy resources: use of alternate energy source, case studies; Role of individuals in conservation of natural resources

Unit - 3	**Number of lectures=0**	**Title of the unit: Eco Systems**

Definition, Scope, and Importance of ecosystem. Classification, structure, andfunction of an ecosystem, Food chains, food webs, and ecological pyramids.Biogeochemical cycles, Bioaccumulation, Biomagnification, Introduction and characteristic featuresof the following eco systems:Forest ecosystem, Grass land ecosystem Desert ecosystem, Aquatic eco systems (ponds, streams, lakes, rivers, oceans,

estuaries)

Unit - 4	Number of lectures=0	Title of the unit: Bio-diversity and Biotic Resources

Introduction, Definition, genetic, species and ecosystemdiversity; Biogeographically classification of India; India as Hot spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, impactof mankind onwildlife;conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

Unit - 5	Number of lectures=0	Title of the unit: Environmental Pollution and Control Technologies

Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Ambient air quality standards, Water pollution: Sources and types of pollution, drinking water quality standards, Soil Pollution: Sources and types, Impacts of modern agriculture,Noise Pollution: Sources and Health hazards,Nuclear hazards,Solid waste: Causes, composition, characteristics of e-Waste and its management.

Pollution control strategies:Overview of different pollution control technologies,Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

Unit - 6	Number of lectures = Nil	Title of the unit: Human population,Social issues and the Environmental Policy

Social issues and Public awareness; Population and its explosion; role of education on HIV/AIDS awareness; Role of information technology in environment and human health;Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management, hazardous waste management and handling rules. EIAstructure. Climate change, global warming, acid rain, ozone layer depletion; Environmental Ethics;Concept of Green Building.

12. Brief Description of self-learning / E-learning component

E-Learning, the online platform, will involve the NPTEL and SWAYAM portal system for the holistic knowledge. Power Point Presentation will be used. Online Lecture series will be beneficial for the students. Online assignment will be designated to students at large. Seminars will be conducted for the broad-spectrum knowledge.

13. Books Recommended (1Text Books + 5 Reference Books)

TEXT BOOKS:

- Environmental Studies, AninditaBasak, Pearson Education, 2009.

REFERENCE BOOKS:

- Tata McGraw Hill Education Private Limited, 2007.
- Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons, 2008.
- Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
- Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.

SGT UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM- 2019-2020
B. Tech. – III Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1		Digital Electronics & Computer Organization	3	0	0	3	40	60	100
2		Signals & Systems	3	0	0	3	40	60	100
3		Network Theory	3	0	0	3	40	60	100
4		Micro Electronics	3	0	0	3	40	60	100
5		Engineering Mathematics III	3	1	0	4	40	60	100
6		Industrial Economics and Management	2	0	0	2	40	60	100
7		Constitution of India	2	0	0	0	40	60	100
8		Digital Electronics & Computer Organization Lab	0	0	2	1	40	60	100
9		Network Theory Lab	0	0	2	1	40	60	100
10		Circuit Simulation with PCB design Lab	0	0	4	2	40	60	100
11		Minor Project phase-I	0	0	2	1	40	60	100
12		Industrial Training –I	0	0	0	1	40	60	100
Total			**19**	**1**	**10**	**24**	**480**	**720**	**1200**
			30						

1. Name of the Department – Electronics And Communication Engineering				
2. Subject Name	**Digital Electronics**	**L**	**T**	**P**
3.Course Code		3	0	0
4. Type of Course (use tick mark)	**Core (√)**	**PE()**	**OE()**	

5. Pre-requisite (if any)	Knowledge of Basic Algebra, Basic Electronics	6. Frequency (use √ marks)	Even ()	Odd (√)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 38	Tutorials =0	Practical =0

8. Course Description

The course covers basic of logic expression, Reduction techniques of Boolean expression. Knowledge of digital systems design based on combinational and sequential logic is also imparted. This course further teaches about PLD, Memories and Logic Families.

9. Course objectives:

1. Understanding the different number systems used in computerized system and codes used to represent the digits and arithmetic operation using each number system and codes.
2. Enabling students to take up application specific sequential circuit to specify the finite state machine and designing the logic circuit.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Verify and analyze the input/output data of each logic gate and circuits such as adders, counters.
2. Apply the digital circuit design concept in developing basic component of computer organization, projects or experiments.

11. Unit wise detailed content

Unit-1	Number of lectures = 8	Number System and Boolean algebra

Review of number system, Boolean algebra: De-Morgan's theorem, PI & EPI, Expression minimization using K-maps & Quine McCluskey method, Introduction to Logic Gates and their combinations to design an digital circuit. Universal logic gates & their uses in designing digital system.
Design various logic gates using digital logic families such as TTL, ECL, CMOS.

Unit – 2	Number of lectures = 10	Combinational & Sequential Circuits

Combinational Circuits: Design of adder & subtractors, Comparators, code converters, encoders & decoders, multiplexers & de-multiplexers, Function realization using multiplexer.
Sequential Circuits: Latches and Flip flops - SR, D, JK and T. Design of Counters and shift registers.

Unit – 3	Number of lectures = 10	Synchronous & Asynchronous Sequential Circuits

Finite State Machine, Mealy/Moore Machines.
Analysis & design of Synchronous sequential circuits, Analysis & design of Asynchronous sequential machines.

Unit – 4	Number of lectures = 10	Programmable Devices & Logic Families

Memories: ROM, RAM, PROM, EPROM, Cache Memories, And PLA, PLD, And FPGA. Program these devices for realization of different logics.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Mano, Morris. "Digital logic." Computer Design. Englewood Cliffs Prentice-Hall (1979).

Reference Books

1. Floyd, Thomas L. Digital Fundamentals, 10/e. Pearson Education India, 1986.
2. Malvino, Albert Paul and Donald P. Leach. Digital principles and applications. McGraw-Hill, 1986.
3. Jain, Rajendra Prasad. Modern Digital Electronics 3. Tata McGraw-Hill Education, 2003.

1. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING

2. Subject Name	Signal & Systems	L – 3	T – 0		P -0	
3.Course Code						
4. Type of Course (use tick mark)		Core (√)	PE()		OE()	
5. Pre-requisite (if	Engineering	6. Frequency	Even	Odd	Either	Every Sem ()

any)	**Mathematics-II**	**(use tick marks)**	()	(√)	Sem ()	

7. Total Number of Lectures, Tutorials, Practical

Lectures = 42	**Tutorials =0**	**Practical =0**

8. Course Description

This subject is about the mathematical representation of signals and systems. The most important representations we introduce involve the frequency domain – a different way of looking at signals and systems, and a complement to the time-domain viewpoint. Indeed engineers and scientists often think of signals in terms of frequency content, and systems in terms of their effect on the frequency content of the input signal.

9. Course objectives: The students will learn and understand

1. Determination of system response for a signal.
2. Fourier and Z transform techniques as tool for signal analysis

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Demonstrate an understanding of the relation among the transfer function, convolution, and the impulse response, by explaining the relationship, and using the relationship to solve forced response problems.
2. Demonstrate an understanding of the relationship between the stability and causality of systems and the region of convergence of their Laplace transforms, by correctly explaining the relationship, and using the relationship to determine the stability and causality of systems.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Introduction to Signals & Systems**

Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables)

Unit – 2	**Number of lectures = 10**	**Laplace-Transform (LT) and Z-transform**

One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC), One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping

Unit – 3	**Number of lectures = 10**	**Fourier Transforms (FT)**

Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT, Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT.

Unit – 4	**Number of lectures = 10**	**Linear Time Invariant**

Continuous Time Systems: Linear Time invariant Systems and their properties. Differential equation & Block diagram representation, Impulse response, Convolution integral, Frequency response (Transfer Function), Fourier transforms analysis. Discrete Time System: Difference equations, Block diagram representation, Impulse response, Convolution sum, MATLAB tutorials.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books:

1. P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delh

1. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING

2. Subject Name	**Network Theory**	**L – 3**	**T – 0**		**P -0**	
3.Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite	**Basic Electrical and**	**6. Frequency**	Even	Odd	Either	Every Sem ()

(if any)	**Electronics Engineering**	**(use tick marks)**	()	(√)	Sem ()	

7. Total Number of Lectures, Tutorials, Practical

Lectures = 39	**Tutorials =0**	**Practical =0**

8. Course Description

Network Analysis and Synthesis is a field of engineering that deals with the study and applications of Graph theory, two port parameters and network synthesis, and also deals with the design and application of active and passive filters. Graph theory is considered to deal with the problems associated with large-scale electrical systems such as power transmission and distribution system. This course lay foundation for the students to study other subjects related to both the engineering streams.

9. Course objectives:

1. To learn the concepts of network analysis in electrical and electronics engineering.
2. To learn linear circuit analysis, graph theory and network theorems.
3. Analyze two port networks using Z, Y, ABCD and h parameters

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Analyze an electric network using graph theory and different network theorems e.g. Thevenin's theorem, superposition theorem, Nodal voltage etc. and power system transmission line using ABCD parameters.
2. Synthesize an electric network using driving point functions
3. Explain the electrical network theories and verify them through experiments

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Graph Theory & Network Theorems**

Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Nodal methods of analysis.
Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

Unit – 2	**Number of lectures = 8**	**Network Functions and Transient analysis**

Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, transient analysis of ac & dc systems.

Unit – 3	**Number of lectures = 9**	**Two Port Networks**

Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Interrelationships between the parameters, inter connections of two port networks, T & Π Representation.

Unit – 4	**Number of lectures = 10**	**Network Synthesis & Filters**

Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Causer first and second forms. Image parameters and characteristics impedance, passive and active filter fundamentals, low pass, high pass, (constant K type) filters, and introduction to active filters.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. A. Chakrabarti, "Circuit Theory" Dhanpat Rai & Co

Reference Books

1. M.E. Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.

1. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING

2. Subject Name	**Micro- Electronics**	**L – 3**	**T – 0**		**P -0**	
3.Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Basic of Electronics**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical		
Lectures = 41	**Tutorials =0**	**Practical =0**

8. Course Description

Analog Electronics is the base of Electronics & Communication stream. In this course the working of various amplifiers is explained. Students learn how BJT work at low and high frequencies, what happens in FET amplifiers, Power amplifiers and feedback amplifiers, different types of oscillators and their working, studying of various types of tuned amplifiers.

9. Course objectives:

1. To learn different biasing techniques and behavior of BJT, FET at low and high frequencies.
2. To understand the principle of operation of different amplifier circuits like feedback amplifiers, power amplifiers.
3. To understand the principle of operation of different oscillators circuits.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Explain the methods of biasing transistors & design of simple amplifier circuits and to develop the ability to analyze and design analog electronic circuits using discrete components.
2. Design, construct, and take measurement of various analog circuits to compare. Experimental results in the laboratory with theoretical analysis.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**BJT at low and high frequencies**

Millers theorem and its dual, cascading transistor amplifier, Hybrid models of CE, CB, CC, configurations, Study of the effect of emitter by pass condenser/resistance at low frequencies, voltage gain, Current Gain, gain bandwidth product, Cascode amplifier, Coupled amplifier.

Unit – 2	**Number of lectures = 8**	**FET amplifiers and Power Amplifiers**

Study of FET Amplifiers: Common source/gate/drain Amplifiers; NMOS/PMOS/CMOS transistor analysis; Power Amplifiers: Classification of amplifiers – class A large signal amplifiers – second harmonic distortion – higher order harmonic generations – computation of Harmonic distortion – Transformer coupled audio power amplifier – efficiency – push - pull amplifier – class B amplifier – class AB operation – Push-Pull circuit with Transistors of Complimentary Symmetry.

Unit – 3	**Number of lectures = 9**	**Feedback Amplifiers**

The feedback concept – Transfer gain with feedback – general characteristics and advantages of negative feedback– analysis of voltage series, Voltage shunt, current series and current shunt feedback amplifiers – Study of the effect of Negative feedback on Gain, Bandwidth, Noise, Distortion, Input and Output impedances with the help of Block Schematic and Mathematical Expressions.

Unit – 4	**Number of lectures = 12**	**Oscillators and FET Amplifiers**

Sinusoidal oscillators –phase shift oscillator – Wien bridge oscillator – Hartley oscillator – Colpits oscillator – frequency stability, Crystal oscillators.

Common source, Common gate and Common drain Amplifiers – problems. Analysis of Single tuned, Doubled tuned and stagger tuned amplifiers.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Jacob. Millman, Christos C.Halkias, 'Electronic Devices and Circuits', Tata McGraw Hill Publishing Limited, New Delhi, 2008, ISBN 0070634556, 9780070634558.

1. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING						
2. Subject Name	**Engineering Mathematics- III**	**L** – 3	**T – 1**		**P -0**	
3.Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if	**Engineering**	**6. Frequency**	Even	Odd	Either	Every Sem ()

any)	**Mathematics- II**	**(use tick marks)**	()	(√)	Sem ()	

7. Total Number of Lectures, Tutorials, Practical

Lectures = 54	**Tutorials =10**	**Practical =0**

8. Course Description

9. Course objectives: The objective of this course is to:

1. Develop a foundation of set theory concepts and notation
2. Demonstrate the application of logic to analyzing and writing proofs

10. Course Outcomes (COs): At the end of the course student will be able to:

1. Construct proofs using direct proof or by contraposition or by contradiction or by cases
2. Construct mathematical arguments using logical connectives and quantifiers and verify the Correctness of an argument using propositional and predicate logic and truth tables.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Fourier Series and Fourier Transforms**

Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and consine series. Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

Unit – 2	**Number of lectures = 12**	**Functions of Complex Variable**

Definition, Exponential function, Trignometric and Hyperbolic functions, Logrithmic functions. Limit and Continuity of a function, Differnetiability and Analyticity. Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and fourmula

Unit – 3	**Number of lectures = 10**	**Power series, radius and circle of convergence**

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeroes and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

Unit – 4	**Number of lectures = 10**	**Probability Distributions and Hypothesis Testing**

Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

UNIT- 5	**Number of lectures = 10**	**Testing of a hypothesis**

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit. Linear Programming: Linear programming problems formulation, Solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

1. Engg Mathematics By Babu Ram, Pearson India

1. Name of the Department – Electronics And Communication Engineering

2. Subject Name	**Industrial Economics & Management**	**L – 3**	**T – 0**		**P -0**	
3.Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Economics**	**6. Frequency**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical		
Lectures = 50	**Tutorials =0**	**Practical =0**

8. Course Description

The course describes the basics of demand and demand forecasting. It explains cost functions, cost control, cost reduction and pricing techniques.

9. Course objectives:

1. To describe the role of the company in the society, the different business cultures, and how companies are organized and managed from a business concept to ongoing operations with the support of strategic planning, formulation of Objectives and management control.
2. To describe central theories within the field of industrial management, such as costing, and to master terminology within the field. Furthermore, to have the ability to use tools in fields such as costing and investment analysis.

10. Course Outcomes (COs):

1. Get an idea of Pricing Practices.
2. Get an idea of Market Equilibrium and Price determination.
3. Develop Strategies to incorporate knowledge of good practices of foreign market in indigenous market.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Introduction**

Introduction: The Scope and Method of Managerial economics – Fundamental Economics concepts Managerial Economics with other subjects -Objectives of the Firm.

Unit – 2	**Number of lectures = 10**	**Demand and Supply Analysis**

Meaning, Types and Determinants – Demand estimation- Demand elasticity for decision making Business and Economic forecasting: Qualitativeand Quantitative methods – Supply analysis: Meaning, elasticity and determinants – Market equilibrium and price determination.

Unit – 3	**Number of lectures = 10**	**Production Economics**

Production and Production function – Types – Estimation – Returns to Scale – Economies and Diseconomies of Scale and Economies of Scope.Factor Inputs - Input-Output Analysis.

Unit – 4	**Number of lectures = 10**	**Market Structure**

Perfect Competition – Imperfect Competition: Monopoly – Monopolistic – Oligopolistic Strategy, Cartels, Cournot, Kinked Demand and Price Leadership. Oligopolistic Rivalry & Theory of Games – Measurement of economic concentration – Policy against monopoly and restrictive trade practices - Competition Law – Pricing Practices: Objectives – Determinants – Pricing Methods – Government Policies and Pricing.

Unit – 5	**Number of lectures = 10**	**Introduction to Macroeconomics**

Circular Flow of Income and Expenditures – Components of National Income and its significance - Measuring Gross Domestic Product (GDP) –Inflation and Business Cycles – Government Fiscal and Monetary Policy - Balance of payments – Foreign exchange markets

12. Brief Description of self-learning / E-learning component

13. Books Recommended

Text Books

1. P.L. Mehta – Managerial Economics Analysis, Problems and cases, Sultan Chand & Co. Ltd., 2001

Reference Books

1. Peterson and Lewis: Managerial Economics, 4th Ed., Prentice Hall , 2004
2. Dholakia and Oza: Microeconomics for Management Students, 2nd Edition, Oxford University

1. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING						
2. Subject Name	**Constitution of India**	**L –** 3	**T – 0**		**P -0**	
3.Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical		
Lectures = 38	**Tutorials =0**	**Practical =0**
8. Course Description		
9. Course objectives:		
10. Course Outcomes (COs):		
11. Unit wise detailed content		
Unit-1	**Number of lectures = 8**	**Introduction to Indian constitution**
Salient features of Indian Constitution, Nature of Indian Constitution- Unitary or Federal, Preamble of Constitution, Citizenship.		
Unit – 2	**Number of lectures = 10**	**Fundamental Rights – I**
Definition of State (Article 12), Laws inconsistent with Fundamental Rights (Article 13), Right to Equality (Article 14-18)		
Unit – 3	**Number of lectures = 10**	**Fundamental Right – II**
Freedom of Speech &Expression (Art. 19), Protection in respect of conviction of offences (Art. 20), Protection of Life & Personal Liberty (Art. 21), Safeguards against arbitrary arrest & detention (Art. 22)		
Unit – 4	**Number of lectures = 10**	**Fundamental Right – III**
Right against Exploitation (Art. 23-24), Right to Freedom of Religion (Art. 25-28), Cultural & Educational Right (Art. 29-30), Right to Constitutional remedies (Art. 32- 35), Directive Principles & Fundamental Duties: Directive Principles of State Policy (Art. 36-51), Fundamental Duties (Art. 51A), Basic Features of Constitution &Procedure for Amendment of Constitution		
12. Brief Description of self-learning / E-learning component		
13. Books Recommended 1.N. Shukla, Constitution of India, Eastern Book Agency, 201 1. P. Jain, Indian Constitutional Law, Lexis Nexis, 201 2. D. Basu, Introduction to the Indian Constitution of India, (20th Ed. 2009 3. N. Shukla, Constitution of India, Eastern Book Agency, 201 4. P. Jain, Indian Constitutional Law, Lexis Nexis, 201 5. D. Basu, Introduction to the Indian Constitution of India, (20th Ed. 2009 6. M. Seervai, Constitutional Law of India, Universal Law Publishing Co., Reprint 201 7. Glanville Austin, Indian Constitution – cornerstone of the Nations, Oxford University Press, 199 8. M. Bakshi, The Constitution of India, Universal Law Publishing Co., 2011 9. D. Basu, Shorter Constitution of India (14th Ed. 2008, reprint 2010)		

1. Name of the Department : Electronics and Communication Engineering				
2. Subject Name	**Digital Electronics & Computer Organization Lab**	**L**	**T**	**P**
3. Course Code		0	0	2

4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Knowledge of Basic Algebra, Basic Electronics Lab**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 14**			

8. Brief Syllabus

The course introduces Boolean algebra, Reduction techniques and demonstrates the design of logic gates. Knowledge of digital systems design based on combinational and sequential logic is also imparted. This course further teaches about PLD, Memories and Logic Families.

9. **Course Objectives**

1. Verifying and analyzing the practical digital circuits.
2. Enabling students to take up application specific sequential circuit to specify the finite state machine and designing the logic circuit.

10. Course Outcomes

On completion of this course, the students will be able to

1. Verify and analyze the input/output data of each logic gate and circuits such as adders, counters, coders, etc.
2. Analyze the basic operation of memory cell and its limitations in circuit designing.

11. List of Experiments

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, gates using TTL ICs concept of VCC and ground, verification of the truth tables of logic gates using TTL
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Static and Dynamic Characteristic of NAND and Schmitt-NAND gate(both TTL and MOS).
10. Study of Arithmetic Logic Unit.

12. **Brief Description of self learning / E-learning component**

13. Books Recommended (3 Text Books + 2-3 Reference Books)

1.Mano, Morris. "Digital logic." Computer Design. Englewood Cliffs Prentice-Hall (1979).

2. Kumar, A. Anand. Fundamentals of Digital Circuits 2Nd Ed. PHI Learning Pvt. Ltd., 2009.

3. Floyd, Thomas L. Digital Fundamentals, 10/e. Pearson Education India, 1986.

4. Malvino, Albert Paul, and Donald P. Leach. Digital principles and applications. McGraw-Hill, Inc., 1986.

5. Jain, Rajendra Prasad. Modern Digital Electronics 3e. Tata McGraw-Hill Education, 2003.

1. Name of the Department : Electronics and Communication Engineering				
2. Subject Name	**Network Theory Lab**	**L**	**T**	**P**
3. Course Code		0	0	2
4. Type of Course (use tick		**Core (√)**	**PE()**	**OE()**

mark)						
5. Pre-requisite (if any)	**Basic Electrical and Electronics Engineering Lab**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 14**			

8. Course Description

Network Analysis and Synthesis is a field of engineering that deals with the study and applications of Graph theory, two port parameters and network synthesis, and also deals with the design and application of active and passive filters. Graph theory is considered to deal with the problems associated with large-scale electrical systems such as power transmission and distribution system. This course lay foundation for the students to study other subjects related to both the engineering streams.

9. Course Objectives

1. To learn linear circuit analysis, graph theory and network theorems.
2. Analyze two port networks using Z, Y, ABCD and h parameters.

10. Course Outcomes

On completion of this course, the students will be able to

1. Design active and passive filter circuits.
2. Explain the electrical network theories and verify them through experiments.

11. List of Experiments

1. To verify Thevenin's theorem in a.c.
2. To verify Norton's theorem in a.c.
3. To verify Superposition theorem in a.c.
4. To verify the Maximum Power Transfer Theorem.
5. Determination of Z-parameters of a two-port network.
6. To verify and determination of Y-parameters of a parallel connected two-port network.
7. Determination of H-parameters of a two-port network.
8. To verify and determination of ABCD-parameters of a cascade interconnected two-port network.
9. Determination of characteristics impedance of a symmetrical T-network using S/C and O/C test.
10. To determine equivalent parameter of parallel connections of two port network and study loading Effect.

Note: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & setup by the concerned institution as per the scope of the syllabus.

12. **Brief Description of self learning / E-learning component**

13. Books Recommended

Text Books

1. D.Roy Choudhary, "Networks and Systems" Wiley Eastern Ltd.

Reference Books

1. M.E. Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
2. A.Chakrabarti, "Circuit Theory" Dhanpat Rai & Co.
3. M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India

1. Name of the Department : Electronics and Communication Engineering

2. Subject Name	**Circuit Simulation with PCB Design Lab**	**L**	**T**	**P**
3. Course Code		0	0	2

4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Knowledge of Electronics Components**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 14**			

8. Course Description

The course includes the description of Electronic components, understanding of Electronics Project Design Flow, Knowledge of Schematic Design techniques, Knowledge of PCB Design techniques.

9. **Course Objectives**

1. Verifying and analyzing the practical digital circuits.
2. Enabling students to take up application specific sequential circuit to specify the finite state machine and designing the logic circuit.

10. Course Outcomes

On completion of this course, the students will be able to

1. To do the circuit design and simulation
2. Can work for PCB Design.
3. Will get exposure to complete PCB Design & manufacturing process.
4. Knowledge of Understanding of Electronics Project Design Flow.

11. List of Experiments

1. Simulation of one rectifier circuit and one clipper/clamper circuit.
2. Simulation of any one transistor biasing circuit.
3. Simulations of CE single/double stage amplifier circuit.
4. Simulation of any one power amplifier circuit.
5. Simulation of any one JFET/MOSFET amplifier circuit.
6. Simulation of any one negative feedback circuit.
7. Simulation of encoder/multiplexer circuit.
8. Simulation of decoder/de multiplexer circuit.
9. Simulation of any one flip-flop circuit using gates.
10. Simulation of any one register/counter circuit.
11. Design of PCB for any one circuit from experiment 1 to 6.
12. Design of PCB for any one circuit from experiment 7 to 10.

Note: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & setup by the concerned institution as per the scope of the syllabus.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

1. Name of the Department: Electronics and Communication Engineering				
2. Course Name	Industrial Training I	**L**	**T**	**P**
3. Course Code		**0**	**0**	**0**
4. Type of Course (use tick		**Core (✓)**	**PE()**	**OE()**

mark)						
5. Pre-requisite (if any)	Technical Knowledge & Professional Skills	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 28		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

1. Select the domain to apply your whole knowledge & skills to improve engineering
2. Choose correct field to work further.
3. Select the few papers & review them either on same software or through different emulator/simulator.
4. Summarize the work and present in national/international conference at least.

9. Course Objectives:

1. To gain first-hand experience of working as an engineering professional, including the technical application of engineering knowledge.
2. To experience the discipline of working in a professional organization and multidisciplinary team.
3. To develop technical, interpersonal and communication skills.

10. Course Outcomes

On completion of this course, the students will be able to get the structure of industry. He will know the various departments of industry & how industry works.

11. Course Content

1. After 2nd semester & before 3rd semester.
2. Duration for training should be 1 Months.
3. It must be in Industry for study the working process & determine problems & propose solution.
4. Students have to submit to one spiral binding report & PPT presentation in internal examination.
5. Students have to submit three Hard binding report & PPT presentation in final end term examination

1 Name of the Department: Electronics and Communication Engineering				
2 Course Name	**Minor Project-Phase I**	**L**	**T**	**P**
3 Course Code		**0**	**0**	**2**

4 Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5 Pre-requisite (if any)	**Knowledge of Electronics Components**	**6 Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	EverySem ()
7 Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 28		**Tutorials = 0**	**Practical = 0**			

8 Course contents:

1. The students are required to develop a product form the idea & knowledge he has.
2. Students will be allotted to a guide throughout the whole work for the guidance and supervision. .
3. The final Viva-voce of this will be conducted by the external examiner and one internal examiner appointed by the institute. External examiner will be from penal of examiner.
4. Assessment of this will be based on viva-voca, report and presentation of the work.

9 Course Objectives:

The objectives of the Minor Project Phase I include:

1. To give students the opportunity to apply the knowledge and skills they have acquired on campus into an idea that they want to developed.
2. To provide students with opportunities for practical, hands-on learning from practitioners in the students' areas of specialization.
3. To enhance the practical skills of the students so he becomes ready for work.

10 Course Outcomes: The learning outcomes can be as follows:

1. Apply theoretical knowledge in practical applications.
2. Acquire skills in communication, management and team work.

SGT UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM- 2019-2020
B. Tech. – IV Semester

Sr.	Subject	Course title	Schedule	Mark

No.	Code		L	T	P	C	Int.	Ext.	Total
1		Analog Integrated Circuit	3	0	0	3	40	60	100
2		Electromagnetic Theory	3	0	0	3	40	60	100
3		Analog Communication	3	0	0	3	40	60	100
4		Interfacing with µP & µC	3	0	0	3	40	60	100
5		Numerical Method	3	1	0	4	40	60	100
6		VA Course-I	2	0	0	0	40	60	100
7		Integrated Circuit Lab	0	0	2	1	40	60	100
8		Analog Communication Lab	0	0	2	1	40	60	100
9		Interfacing with µP & µC Lab	0	0	2	1	40	60	100
10		Major Project phase- I	0	0	4	2	40	60	100
Total Contact Hours			**17**	**1**	**10**	**21**	**400**	**600**	**1000**
			28						

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	**Analog Integrated Circuits**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE ( )**		**OE ( )**	
5. Pre-requisite	**Semiconductor Devices**	**6.**	**Even**	**Odd**	**Either Sem**	**Every**

(if any)	and Circuits	Frequency	(√)	( )	( )	Sem ( )

7. Total Number of Lectures, Tutorials, Practical		
Lectures = 45	**Tutorials = 0**	**Practical = 0**

8. Brief Syllabus: To enable the students to understand the fundamentals of integrated circuits and designing electronic circuits using it. Analysis of four quadrant and variable trans-conductance multipliers, Voltage controlled Oscillator D/A converter- Current driven DAC, Switches for DAC, A/D converter Wave shaping circuits, Multivibrator - Monostable & Bistable, Schmitt Trigger circuits, IC 555 Timer, Application of IC 555, Frequency to Voltage converters.

9. Learning objectives:

The student will be able to learn and understand

1. Architecture, electrical characteristics and applications of OP-AMP.
2. Architecture, Characteristics and Applications of PLL, ADC, DAC and regulators.
3. Apply the methods learned in the class to design and implement practical problem

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Demonstrate the ability to apply the practice of Analog Integrated Circuits in real-world problems.
2. Design, layout, and testing of Op Amps and other analog circuits.
3. Identify, formulate, and solve engineering problems in Analog Integrated Circuit Design

11. Unit wise detailed content

Unit - 1	Number of lectures = 12	Operational Amplifiers

Analysis of difference amplifiers, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate, Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers

Unit – 2	Number of lectures = 11	Applications of Operational Amplifiers

Differentiator, Integrator Voltage to Current convertor, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.

Unit – 3	Number of lectures = 11	Analog Multiplier and PLL

Analysis of four quadrant and variable trans-conductance multipliers, Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, Commander ICs.

Unit – 4	Number of lectures = 11	D/A and D/A Converters

Analog switches, High speed sample and hold circuits and sample and hold IC's, Types of D/A converter-Current driven DAC, Switches for DAC, A/D converter, Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to frequency converters.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

1. Ramakant A. Gayakwad, "OP - AMP and Linear IC's ", 4th Edition, Prentice Hall, 2000, ISBN 0132808684, 9780132808682

2. Millman J. and Halkias C.C., "Integrated Electronics ", McGraw Hill, 2001, ISBN 0074622455, 9780074622452

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	Electromagnetic Theory	L	T		P	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		Core (√)	PE ( )		OE ( )	
5. Pre-requisite (if any)	Mathematical Foundation Course on Vectors	6. Frequency	Even (√)	Odd ( )	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						

Lectures = 45	Tutorials = 0	Practical = 0

8. Brief Syllabus: Unit I Discusses basics of Electromagnetic Field theory. Unit II Signifies applications of Electrostatic and Magnetic Field Applications. Unit III Provide detail study of time varying Electric and Magnetic field. Unit IV gives Wave propagation study of Electromagnetic field.

9. Learning objectives: The students will learn and understand

1. Understand the concepts of Electrostatics and their applications.
2. Learn the concept of Electromagnetic Fields, waves and wave propagation.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Analyze Vector Mathematics related to Electric and Magnetic Field
2. Analyze theory on Wave propagation

11. Unit wise detailed content

Unit - 1	Number of lectures = 12	Basic Concepts Of Field Theory

Introduction to various Co-ordinate Systems - Sources and effects of electromagnetic fields. Divergence theorem-Strokes theorem- Field theory and circuit theory comparison- Electric field intensity. Electric fields due to point, line, surface and volume charge distributions – Electric flux density- Coulomb's law. Introduction to magnetic circuits – Magnetically induced EMF and Mechanical force, torque calculations.

Unit – 2	Number of lectures = 11	Electrostatics and Magnetostatics Applications

Gauss's law and its applications, Electric field in free space, conductors, dielectric -Dielectric polarization. Dielectric strength - Electric field in multiple dielectrics. Boundary conditions, Poisson's and Laplace's equations. Determination of Capacitance- Energy density problems.

Magnetic field due to straight conductors, circular loop, infinite sheet of current using Ampere and Bio-Savart law. Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization. Magnetic field in multiple media – Boundary conditions.

Unit – 3	Number of lectures = 11	Time Varying Electric and Magnetic Fields

Faraday's laws – Transformer and motional EMF-continuity current equation–Displacement current-conduction current. Energy in quasi-stationary Electromagnetic Fields. Maxwell's equations (differential, integral forms and sinusoidal variation of field with time). Potential for time varying fields, flow of power in electromagnetic field-Poynting vector.

Unit – 4	Number of lectures = 11	Electromagnetic Waves

Wave equations, Wave parameters, velocity, intrinsic impedance-quantitative analysis propagation constant. Electromagnetic wave equation for free space, lossy/lossless dielectrics. Wave equation for conductors-skin depth. Plane wave reflection and refraction, incidence of plane wave at the boundary b/w two region ratios, Input impedances, Standing wave, critical angle of incidence, Brewster angle.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books:

1. William Hayt, "Engineering Electromagnetics", McGraw Hill, New York, 7th edition, 2014.
2. Matthew. N.O. Sadiku, "Elements of Electromagnetics", Fourth Edition, Oxford University Press,

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	Analog Communication	L	T		P	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		Core (√)	PE ( )		OE ( )	
5. Pre-requisite (if any)	Signal and systems	6. Frequency	Even (√)	Odd ( )	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						

Lectures = 45	Tutorials = 0	Practical = 0

8. Brief Syllabus: Communication is the basic process of exchanging information. **Analog** Communication, as the name suggests is the subject which deals with the techniques employed in communication and basically analog in nature. It is a common knowledge that understanding digital communication is impossible if one does not have a knowledge in analog communication methods.

9. Learning objectives:

1. Concepts of communication engineering.
2. Different analog modulation techniques used.
3. Systematic comparison of various modulation techniques.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Understand different modulation and demodulation techniques.
2. Apply signal and system analysis tools in the time and frequency domains, including impulse response, convolution, frequency response, Fourier series, Fourier transform, and Hilbert transform.
3. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

11. Unit wise detailed content

Unit - 1	Number of lectures = 12	Basics of Communication Theory

Need and Importance of Communication, Types of communication systems- Simplex and Duplex systems, Analog and digital systems, Applications of Electronic Communications, Electromagnetic Spectrum used in communication and various frequency bands, Concept of bandwidth. Noise in communication and types of noise (External and Internal), Noise voltage, Signal-to-noise ratio, Noise Figure, Noise temperature.

Unit – 2	Number of lectures = 11	Amplitude Modulation

Baseband and pass band signals. Amplitude Modulation(AM)- generation & demodulation, Modified forms of AM- Double sideband suppressed carrier (DSBSC), single sideband suppressed carrier (SSBSC) and Vestigial sideband (VSB) modulation, Mixers, Frequency Division Multiplexing.

Unit – 3	Number of lectures = 11	Angle Modulation

Phase modulation (PM) and Frequency modulation (FM), narrow and wideband FM, Generation & demodulation, phase locked loop (PLL), homodyne and heterodyne receivers, elements of TV broadcast and reception; Noise in CW modulation: Receiver model, SNR, noise figure, noise temperature, noise in DSB-SC, SSB, AM & FM receivers, pre-emphasis and de-emphasis.

Unit – 4	Number of lectures = 11	Pulse Modulation

Sampling Process, Basics of Pulse modulation, Types of Pulse Modulation – PAM, PWM and PPM.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Simon Haykin, "Communication Systems", 4th edition, John Wiley & Sons, 2006, ISBN 812650904X, 9788126509041
2. R. E. Ziemer, W. H. Tranter: "Principles of Communications: Systems, Modulation, and Noise", 5th Edition, Pearson Education India, 1998, ISBN 8131703266, 9788131703267

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	Interfacing with µP & µC	L	T	P		
3. Subject Code		3	0	0		
4. Type of Subject (use tick mark)		Core (√)	PE ( )	OE ( )		
5. Pre-requisite (if any)	Digital Design/Computer Architecture	6. Frequency	Even (√)	Odd ( )	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						

Lectures = 45	Tutorials =0	Practical =0

8. Brief Syllabus: Course consists of various microprocessor and microcontrollers. It also comprises the interfacing & programming for the development of different applications.

9. Learning objectives:

1. To gain an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques with peripheral devices
2. To gain an understanding of applications of microprocessors in designing processor-based automated electronics system.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Explain the internal organization and operation of microprocessors/microcontrollers.
2. Program 8086 Microprocessor, 8051 and PIC Microcontrollers for application specific solution
3. Implement and develop new experiments on microprocessor/microcontroller based systems.

11. Unit wise detailed content

Unit - 1	Number of lectures = 12	Introduction

Introduction to Microprocessors, Microcontrollers. System design: Assembly and High Level language programming. System Development Environment: assembler, compiler and integrated development environment.

Unit – 2	Number of lectures = 11	8086 Microprocessor & interfacing

Architecture, Programming: Instruction sets, addressing modes and Interrupts and interrupts handling. **I/O Interfacing:** 8255 PPI interface, DMA controller interface.

Unit – 3	Number of lectures = 11	8051 Microcontroller

MCS-51 family features, Architecture Instruction set & programming, addressing modes– Programming interrupts, timers and serial communication–system design with 8051. Interfacing to various input and output device & their programming.

Unit – 4	Number of lectures = 11	Introduction to Embedded Systems

System level interfacing design; ARM microcontrollers; Embedded system design methodologies.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Barry B Brey, The Intel microprocessor: Architecture, programming and interfacing, PHI, 2003. ISBN: 0138027455, 4th Edition.

2. Mohammad Ali Mazidi and Janice Gillispie Maszidi "The 8051 Microcontroller and Embedded Systems" Pearson education, 2003, ISBN- 9788131710265, 2nd Edition.

Reference Books

1. Kenneth J. Ayla, "The 8051 Microcontroller", Thomson learning, 3rd edi, 2004, ISBN-140186158X

2. Alan Clements, "Principles of Computer Hardware", Oxford University Press, 3rd Edition, 2003.

1. Name of the Department – Electronics & Communication Engineering

2. Subject Name	Numerical Method	L	T	P		
3. Subject Code		3	1	0		
4. Type of Subject (use tick mark)		Core (√)	PE ( )		OE ( )	
5. Pre-requisite (if any)	Engg. Mathematics	6. Frequency	Even (√)	Odd ( )	Either Sem ( )	Every Sem ( )

7. Total Number of Lectures, Tutorials, Practical

Lectures = 45	Tutorials =0	Practical =0

8. Brief Syllabus: Syllabus covers basic of mathematics methodologies ranges from linear & non linear

equations, interpolation. It also covers numerical differentiation and integration.

9. Learning objectives:

To enhance problem solving skills of engineering students using a powerful problem solving tool namely numerical methods. The tool is capable of handling large systems of equations, nonlinearities and complicated geometries that are common in engineering practice but often impossible to solve analytically.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Apply various numerical methods and appreciate a trade off in using them.
2. Understand the source of various types of errors and their effect in using these methods.
3. To distinguish between Numerical and Analytical methods along with their Merits and demerits.

11. Unit wise detailed content

Unit - 1	**Number of lectures = 12**	**Non- Linear Equations and system of Linear Equations**
Introduction, error and error propagation, Bisection method, False position Method, Method of Iteration, Newton-Raphson Method, Secant Method, Gauss Elimination method Gauss – Jordan method, Gauss – Seidel method, convergence of iterative methods.		
Unit – 2	**Number of lectures = 11**	**Interpolation**
Newton's Forward and Backward Interpolation, Lagrange's Interpolation, Newton's Divided Difference Interpolation, Inverse Interpolation.		
Unit – 3	**Number of lectures = 11**	**Numerical Differentiation and Integration**
Derivations from difference tables, Higher order derivations. Newton – Cotes integration formula, Trapezoidal rule, Simpson's rule, Boole's rule and Weddle's rule, Romberg's Integration		
Unit – 4	**Number of lectures = 11**	**Numerical Solution of Ordinary & Partial Differential Equations**
Taylor series method, Euler and modified Euler method, Runge Kutta methods, Milne's method, Finite Difference method. Finite difference approximations of partial derivatives, Solution of Laplace's equation (Elliptic) by Liebmann's iteration method, Solution of one dimensional heat equation (Parabolic) by Bender-Schmidt method and Crank – Nicolson method, Von-Neumann stability condition, Solution of one dimensional wave equation (Hyperbolic), CFL stability condition.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books:

1. Introductory Methods of Numerical Analysis: S.S. Sastry, PHI learning Pvt Ltd.

Refrence Books:

1. Numerical Methods for Scientific and Engineering computation: M.K Jain, S.R.K Iyengar and R.K Jain, New age Inter-national Publishers.

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	**VA Course I**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Subject (use tick mark)		**Core (√)**	**PE ( )**		**OE ( )**	
5. Pre-requisite (if any)		**6. Frequency**	**Even (√)**	**Odd ( )**	**Either Sem ( )**	**Every Sem ( )**
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 45	**Tutorials = 0**		**Practical = 0**			

8. Brief Syllabus:		
9. Learning objectives:		
10. Course Outcomes (COs): On completion of this course, the students will be able to 1.		
11. Unit wise detailed content		
Unit - 1	**Number of lectures = 12**	
Unit – 2	**Number of lectures = 11**	
Unit – 3	**Number of lectures = 11**	
Unit – 4	**Number of lectures = 11**	
12. Brief Description of self-learning / E-learning component		
13. Books Recommended		
1.		

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	**Integrated Circuit Lab**	**L**	**T**		**P**	
3. Subject Code		0	0		2	
4. Type of Subject (use tick mark)		**Core (√)**	**PE ( )**		**OE ( )**	
5. Pre-requisite (if any)		**6. Frequency**	**Even (√)**	**Odd ( )**	**Either Sem ( )**	**Every Sem ( )**
7. Total Number of Lectures, Tutorials, Practical						

Lectures = 24	Tutorials =0	Practical =0

8. Brief Syllabus: Course cover the basic IC & their applications. Theses IC applications includes analog filter designing, drivers for different motors operation and multi vibrators.

9. Learning objectives:

1. To familiarize the students with the analog computer
2. To help the students understand and practice the modeling, simulation, and implementation of a physical dynamical system by a linear time invariant ordinary differential equation
3. To highlight the electrical modeling of a second order system and analyze the under-damped, over-damped and critically damped cases
4. To familiarize students with Servo-Motor.
5. To implement the basic principles of Servo-Motor calibration.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Students will demonstrate the ability to apply what they have learned theoretically in the field of control engineering using both analog and digital techniques.
2. Students will demonstrate the ability to apply what they have learned theoretically in the field of control engineering using both analog and digital techniques.

11. Contents of Lab

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for–

- Low pass filter of cutoff frequency 1 KHz.
- High pass filter of frequency 12 KHz
- Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.

4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50mA.
7. Voltage to current and current to voltage convertors.
8. Function generator using operational amplifier (sine, triangular & square wave)
9. Astable and monostable multiviberator using IC 555
10. To study speed Torque characteristics of a) A.C. servo motor b) DC servo motor
11. (a) To demonstrate simple motor driven closed loop DC position control system.

(b) To study and demonstrate simple closed loop speed control system.

12. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots.
13. To study a stepper motor & to execute microprocessor or computer-based control of the same by changing number of steps, direction of rotation & speed.
14. To implement a PID controller for temperature control of a pilot plant.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	**Analog Communication Lab**	**L**	**T**		**P**	
3. Subject Code		0	0		2	
4. Type of Subject (use tick mark)		**Core (√)**	**PE ( )**		**OE ( )**	
5. Pre-requisite (if any)	**Signal and systems**	**6. Frequency**	**Even (√)**	**Odd ( )**	**Either Sem ( )**	**Every Sem ( )**

7. Total Number of Lectures, Tutorials, Practical		
Lectures = 24	**Tutorials =0**	**Practical =0**

8. Brief Syllabus: The Lab subject basically deals with the different aspects of a signal and spectra. It also deals with the modulation of signals and different mathematical aspects related to signals. It gives a more analytical look into the basic entities such as those of signals, modulation, noise etc. which form the base for higher studies in telecommunication.

9. Learning objectives:

1. Concepts of communication engineering.
2. Different analog modulation techniques used.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Understand different modulation and demodulation techniques.
2. Develop the ability to compare and contrast the strengths and weaknesses of various modulation techniques.

11. Contents of Lab:

1. To design Modulation and Demodulation of Amplitude Modulated signal.
2. To design modulation and demodulation through DSB-SC techniques.
3. To design modulation and demodulation through SSB-SC techniques.
4. To design modulation and demodulation through vestigel side band techniques.
5. To design Modulation and Demodulation of Frequency modulated Signal.
6. To design Pulse Amplitude Modulation.
7. To design Pulse Width Modulation.
8. To design Pulse Position Modulation.
9. To design Band-pass Filter.
10. To design Mixer Circuit.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Simon Haykin, “Communication Systems”, 4th edition, John Wiley & Sons, 2006, ISBN 812650904X, 9788126509041.
2. Bernard Sklar, "Digital Communication”, Pearson Education India 2009, ISBN 8131720926, 9788131720929.

Reference Books

1. R. E. Ziemer, W. H. Tranter: “Principles of Communications: Systems, Modulation, and Noise”, 5th Edition, Pearson Education India, 1998, ISBN 8131703266, 9788131703267
2. Herbert Taub and Donal L. Schilling, “Principles of communication Systems”, Tata McGraw-Hill Education, 2008, ISBN 0070648115, 9780070648111
3. K. Sam Shanmugam,”Digital and Analog Communication Systems”, John Wiley and Sons, 2006, ISBN 8126509147, 9788126509140.

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	**Interfacing with µp & µc Lab**	**L**	**T**		**P**	
3. Subject Code		0	0		2	
4. Type of Subject (use tick mark)		**Core (√)**	**PE ( )**		**OE ( )**	
5. Pre-requisite (if any)	**Digital Design/Computer Architecture**	**6. Frequency**	**Even (√)**	**Odd ( )**	**Either Sem ( )**	**Every Sem ( )**

7. Total Number of Lectures, Tutorials, Practical

Lectures = 24	Tutorials =0	Practical =0

8. Brief Syllabus: Students will be able to design, construct, program, verify, analyze, and troubleshoot fundamental microprocessor interface and control circuits using related equipments.

9. Learning objectives:

Understanding and implementation of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques with peripheral devices

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Program 8086 Microprocessor, 8051 and PIC Microcontrollers for application specific solution
2. Design microprocessors/microcontrollers-based systems
3. Implement and develop new experiments on microprocessor/microcontroller based systems.

11. Contents of Labs

1. Programming for different mathematical operations.
2. Programming for logical operations
3. Interfacing of display devices
4. Interfacing with actuators.

Microcontroller Lab

1. Programming for various arithmetical & logical operation programming.
2. Interfacing of input & output devices & operate them through programming.
3. Communication to peripherals through programming.
4. Generation of different signals of different duty cycle.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1.
arry B Brey, The Intel microprocessor: Architecture, programming and interfacing, Prentice hall of India, New Delhi, 2003, ISBN-0138027455, 4th Edition
2.
ohammad Ali Mazidi and Janice Gillespie Mazidi "The 8051 Microcontroller and Embedded Systems" Pearson education, 2003, ISBN- 9788131710265, 2nd Edition

Reference Books

1.
enneth J. Ayla, "The 8051 Micro controller", Thomson learning, 3rd edition, 2004, ISBN-140186158X
2.
lan Clements, "Principles of Computer Hardware", Oxford University Press, 3rd Edition, 2003, ISBN-9780198564539

1. Name of the Department – Electronics & Communication Engineering						
2. Subject Name	**Minor project phase - I**	**L**	**T**	**P**		
3. Subject Code		0	0	2		
4. Type of Subject (use tick mark)		**Core (√)**	**PE ( )**	**OE ( )**		
5. Pre-requisite (if any)		**6. Frequency**	**Even (√)**	**Odd ( )**	**Either Sem ( )**	**Every Sem ( )**

7. Total Number of Lectures, Tutorials, Practical		
Lectures = 24	**Tutorials =0**	**Practical =0**

8. Brief Syllabus: Students will be able to design, construct, program, verify, analyze, and troubleshoot fundamental microprocessor interface and control circuits using related equipments.

9. Learning objectives:

The objectives of the Minor Project Phase II include:

4. To give students the opportunity to apply the knowledge and skills they have acquired on campus into an idea that they want to developed.
5. To provide students with opportunities for practical, hands-on learning from practitioners in the students' areas of specialization.
6. To enhance the practical skills of the students so he becomes ready for work.

10. Course Outcomes (COs): The learning outcomes can be as follows:

3. Apply theoretical knowledge in practical applications.
4. Acquire skills in communication, management and team work.

11. Course Contents:

5. The students are required to develop a product form the idea & knowledge he has.
6. Students will be allotted to a guide throughout the whole work for the guidance and supervison. .
7. The final Viva-voca of this will be conducted by the external examiner and one internal examiner appointed by the institute. External examiner will be from penal of examiner.
8. Assessment of this will be based on viva-voca, report and presentation of the work.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

B. Tech. – V Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1		Antenna wave propagation	3	0	0	3	40	60	100
2		Digital Communication	3	0	0	3	40	60	100
3		DSP with simulation	3	0	0	3	40	60	100
4		Program Elective-I	3	0	0	3	40	60	100
6		Open Elective -I	3	0	0	3	40	60	100
7		Essence of Indian knowledge Traditional	2	0	0	0	40	60	100
8		Antenna Design & Simulation Lab	0	0	2	1	40	60	100
9		Digital Communication Lab	0	0	2	1	40	60	100
10		DSP with Simulation	0	0	2	1	40	60	100
11		Manor Project phase -II	0	0	2	1	40	60	100
12		Industrial Training-II	0	0	0	1	40	60	100
13		General Lab -I	0	0	2	1	40	60	100
Total Contact Hours			**17**	**0**	**10**	**21**	**520**	**780**	**1300**
			27						

1. Name of the Department –ELECTRONICS & COMMUNICATION ENGINEERING					
2. Course Name	**Antenna wave propagation**	**L –** 3	**T – 0**		**P -0**
3.Course Code					
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**
5. Pre-requisite	Electromagnetic Field	**6. Frequency (use**	Even	Odd	Either / Every

(if any)	Theory	**tick marks)**	()	(√)	Sem ()	Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 38	**Tutorials =0**	**Practical =0**

8. Brief Syllabus

The above said subject is divided into 4 units. Unit I Discusses basics of Antenna Parameters. Unit II Gives derivations of Field Equations. Unit III Provide study of Arrays and Dipole Antenna Unit IV . Study characteristics of Arrays and Wave Propagation.

9. Learning objectives: The students will learn and understand

1. To develop and apply the mathematical tools to analyze radiation characteristics of aperture antennas.
2. To design and analyze various broadband, high gain, planar antennas and antenna arrays.
3. To summarize different diversity and combining techniques.
4. To study smart antenna and algorithms.

10. Course Outcomes (COs): On completion of this course, the students will be able to

3. Describe various parameters and outline radiation equations.
4. Design various types of radiators for wireless communications.
5. Analyze and synthesize antenna and antenna arrays.
6. Characterize various diversity and combining techniques.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Introduction**

Retarded potential, field of short dipole, Antenna pattern & antenna parameters Antenna pattern, Gain, Directivity, Radiation resistance, Aperture, Beam-width etc, Reciprocity theorem for antenna.

Unit – 2	**Number of lectures = 8**	**Derivation of Field Equations**

Wave equation for radiated fields from current and voltage sources in terms of electric scalar potential and magnetic vector potential .Fields and pattern of an infinitesimal dipole. Definition of various potentials used in antenna theory.

Unit – 3	**Number of lectures = 9**	**Antenna Arrays, Half Dipole Antenna**

Two element array, broad side Wave equation for radiated fields from current and voltage sources in terms of electric scalar potential and magnetic vector potential. Fields and pattern of an infinitesimal dipole. Definition of various potentials used in antenna theory.

Relation between current distribution and field pattern of an antenna, linear antenna, half wave dipole, Antenna impedance, Directivity, Radiation resistance, Directional properties, Effect of ground on antenna pattern, Input impedance Broad band matching, End fired pattern.

Unit – 4	**Number of lectures = 9**	**Characteristics of Arrays and Wave Propagation**

Beam width pattern multiplication, multi element array and their properties, Synthesis of an array. Parabolic feed antenna, conical, helix, log periodic, horn, Microwave antenna ground waves propagation, Space waves propagation, Effect of Earth, Duct formation, Ionosphere, and sky wave.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

1. Antennas by J.D.Kraus, TMH.
2. Antenna & Wave Propagation by K.D Prasad.

1. Name of the Department – ELECTRONICS & COMMUNICATION ENGINEERING

2. Course Name	**Digital Communication**	**L** – 3	**T – 0**		**P -0**	
3.Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Analog Communication	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical		
Lectures = 40	**Tutorials =**	**Practical =**

8. Brief Syllabus

This course will introduce students to the concept of analog digitization using PCM, maximum-likelihood design, digital modulation and demodulation techniques, and performance of digital communication systems using error probability. Student will learn about multiple access techniques after completion of this course.

9. Learning objectives: The student will learn and understand

1. Difference between analog and digital communication systems, and compare their respective advantages and disadvantages.
2. Role of Digital Modulation and Demodulation techniques in different application.

10. Course Outcomes (COs): The students will be able to

1. Explain the meaning and significance of the following: Shannon's channel capacity theorem, super-heterodyne receiver, multiplexing and multiple access
2. Apply the sampling theorem to quantify the fundamental relationships between channel "bandwidth" (in hertz), digital symbol rate, and bit rate (in bits/sec).
3. Understand the concept of Spread Spectrum techniques and Multiple Access Techniques.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Communication System & Information Theory**

Mathematical Models of Communication Channel. Information and Channel Capacity, Entropy, Discrete and Continuous Channels, Fano and Huffman's Coding. Overview of Sampling, Quantization – Uniform and Non-uniform (A-law & μ-law), Encoding Techniques for Analog Sources. Classification of line codes, characteristics and power spectra of line codes.

Unit – 2	**Number of lectures = 8**	**Baseband Transmission**

Baseband data Transmission Systems: Baseband and Band pass transmission through AWGN channel, Coherent and non coherent receiver structures, Error Probability, Pulse Shaping, M-ary Signaling Schemes, Matched Filter, Equalization, ISI, Eye Pattern analysis, Symbol Synchronization.

Unit – 3	**Number of lectures = 8**	**Modulation Schemes**

Digital Modulation Schemes, ASK, PSK, FSK and QAM systems, Probability of Error in Digital Modulation Schemes, Continuous Phase Carrier Modulation, Differential modulation schemes, receiver structure and error performance, Performance comparison of modulation schemes

Unit – 4	**Number of lectures =14**	**Speech Coding Techniques**

Adaptive Delta Modulation, Speech coding, Linear Predictive Coding, Sub band Coding, Adaptive Transform Coding; **Spread Spectrum & Multiple Access Techniques:** Generation of PN Sequences – Properties of PN Sequences – Direct Sequence Spread Spectrum – Frequency Hopped Spectrum. Introduction to Multiple Accesses – TDM/TDMA – FDM/FDMA – CDMA – SDMA - OFDM/OFDMA.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

1. Simon Haykin, "Digital Communication", John Wiley, edition- 2009, ISBN 0-471-17869-1

1. Name of the Department – ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**Digital Signal Processing With Simulation**	**L -** 3	**T – 0**		**P -0**	
3. Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Signals and Systems	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						

Lectures = 40	Tutorials =	Practical =

8. Brief Syllabus

Digital signal processing (DSP) is concerned with the representation of signals in digital form, and with the processing of these signals and the information that they carry. Although DSP, as we know it today, began to flourish in the 1960's, some of the important and powerful processing techniques that are in use today may be traced back to numerical algorithms that were proposed and studied centuries ago.

9. Learning objectives:

1. To impart the knowledge of key DSP concepts and how do they relate to real applications.
2. To introduce to the methods of time domain and frequency domain implementation.

To present a comprehensive introduction to important DSP technologies with a focus on filter design techniques and Fourier analysis of signals using DFT

10. Course Outcomes (COs):

On completion of this course, the students will be able to

1. Apply digital signal processing fundamentals.
2. Acquire the knowledge of representation of discrete-time signals in the frequency domain, using z-transform and discrete Fourier transform.

11. Unit wise detailed content

Unit-1	Number of lectures = 10	Introduction

Basic elements of DSP and its requirement, Advantages of Digital over analog signal processing, sampling theorem, sampling process and reconstruction of sampling data. Discrete time signals & systems: Discrete time signals & systems, classification of discrete time signals and systems, LTI systems, linear convolution, Cross Correlation, Autocorrelation.

Unit – 2	Number of lectures = 10	Z-Transform

The Z-transform: Definition, properties of the region of convergence for the Z-transform, Z-transform properties, Inverse Z-transform, Parseval's theorem, unilateral Z-transform.

Unit – 3	Number of lectures = 10	Discrete and Fast Fourier Transforms

Definition and properties of DFT, IDFT, Relation between DFT and Z–Transform, Radix- 2 FFT algorithms, Linear filtering methods based on DFT, circular convolution, Frequency analysis of discrete time signals using DFT, Gortzel algorithm.

Unit – 4	Number of lectures =12	Multirate DSP

Introduction, Decimation by factor D, Interpolation by factor I, Sampling rate conversion by rational factor I/D, Sub band coding of speech signals and its applications, introduction to wavelet & wavelet transform, Introduction to DSP architecture TMS 320.

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended (3 Text Books + 2-3 Reference Books)

1. J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms and applications, Pearson Education.

Reference Books

1. De Fatta, D.J.Lucas, J.G. & Hodgkiss, W. S.," Digital Signal Processing", John Wiley& Sons.

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	Measurements and Instrumentation	L	T		P	
3. Course Code		3	0		0	
4. Type of Course (use tick mark)		✓ Core ()	PE()		OE()	
5. Pre-requisite (if any)	Basic Electrical and Electronics Engineering	6. Frequency (use tick marks)	Even ()	Odd (√)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 38	**Tutorials = 00**	**Practical =**

8. Brief Syllabus

This course deals with the basics of Electrical and Electronic measuring instruments used in laboratory and industry. In the process they learn different type of instruments like PMMC, Moving Iron, Electrodynamometer which includes voltmeter, ammeter, wattmeter, energy meter, power factor meter, frequency meter, Q meter, etc. Students will also learn about different AC and DC bridges to obtain various electrical parameters. Display devices which include DVM, CRO, and DSO etc are also learnt to analyze electrical signals in the course.

9. Learning objectives:

1. 1 To know the necessity of different measuring instruments and their design principle
2. To understand the working principle of different measuring instruments and technical solutions to handle different errors.
3. To learn the architecture and working principle of advanced measuring instrument and their applications.

10. Course Outcomes:

On completion of this course, the students will be able to:

1. Learn units, dimensions, standards and errors and basics of different types of measuring instruments to measure different electrical quantities
2. Apply their knowledge to measure electrical quantities using standard analog and digital measuring instruments.

11. Unit wise detailed content

Unit-1	**Number of lectures = 13**	**Philosophy of Measurement & Analog Measurement of Electrical Quantities**

Unit & dimensions, standards, Errors, Characteristics of Instruments and measurement system, basics of statistical analysis. PMMC instrument, DC ammeter, DC voltmeter, Ohm meter, Moving Iron instrument, Electrodynamics Wattmeter, errors and remedies, Three Phase Wattmeter, Power in three phase system, Energy meter.

Unit - 2	**Number of lectures = 05**	**Measurement: Instrument Transformer**

Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor.

Unit - 3	**Number of lectures = 08**	**Measurement of Parameters**

Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges- Wheatstone, Kelvin, Maxwell, Hay's, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Wagner Earthling device, Q Meter.

Unit - 4	**Number of lectures = 08**	**AC Potentiometer & Magnetic Measurement**

Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement. Ballistic Galvanometer, Flux meter. **Digital Measurement:** Concept of digital measurement, Digital voltmeter, Frequency meter, Power Analyzer and Harmonics Analyzer, Electronic, Multimeter. DSO and its applications.

12. Brief Description of self learning / E-learning component The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/ Journal papers; Patents in the respective field.
13. Books Recommended 1. E.W. Golding & F.C. Widdis, "Electrical Measurement &Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons **Reference Books** Forest K. Harries, "Electrical Measurement", Willey Eastern Pvt. Ltd. India

1. Name of the Department-ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**Embedded system**	**L**	**T**		**P**	
3. Course Code		3	0		0	
4. Type of Course (use tick mark)		✓ **Core ()**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Microcontroller	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem	Every Sem ()

					()	

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)

Lectures = 40	**Tutorials = 00**	**Practical =**

Brief Syllabus:

Course consists of PIC microcontroller & their family members architectures and features as well. It also covers the development of PIC based projects for any applications.

8. Learning objectives:

1. The student will learn and understand
1. Fundamental description of PIC microcontroller & their family members.
2. Interfacing of different peripherals & program to operate them

9. Course Outcomes: The students will be able to

1. To develop the smart and intelligent product prototype.
2. Design a PIC microcontroller based applications.

10. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Overview of PIC Microcontrollers**
Introduction to PIC micro controllers, Advantage of PIC micro controllers, Types and products of PIC.		
Unit - 2	**Number of lectures = 10**	**PIC Architecture**
PIC18F4550 architecture, features, CPU registers, Instruction Set; programming		
Unit - 3	**Number of lectures = 10**	**PIC Programming**
Different peripheral device -Difference types of display units -7 Segments & its types -Principle of Operation-Common Anode mode-Common Cathode mode -16x2 LCD - Applications-Hardware interfaces-Interfacing Circuits for LCD & LED -Pin diagram of 16x2- working mechanism LCD using Arrays & Pointers.		
Unit - 4	**Number of lectures = 10**	**Application development**
Interfacing with ADC, use of Interrupts, Serial communication: UART Implementation, Max 232; I2C Protocols I2C Protocol: Programming for I2C Protocol, interfacing with Motors, interfacing with sensors;		

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

12. Books Recommended

References Books

1. PIC microcontroller by Peatman
2. Microchip technologies Datasheet

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING				
2. Subject Name	**Power Electronics**	**L**	**T**	**P**
3. Subject Code		3	0	0
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**	**OE()**

5. Pre-requisite (if any)	NIL	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)

Lectures = 42	**Tutorials = 0**	**Practical =**

8. Brief Syllabus

This course is an introduction to the concepts of Partial differential equations and their solution. The calculus of function of complex variable is discussed. Among the most important topics are Method of separation of variables and its applications to wave equation, one dimensional heat equation and two-dimensional heat flow, Analytic function, Cauchy-Riemann Equations, Harmonic functions with application to flow problem, Zeroes and Singularities of complex valued functions, Residues, Residue theorem and It's application in evaluation of real integrals around unit and semi circle. Z-Transform is also introduced and applied in solving difference equation.

9. Learning objectives:

1. Develop the skills to gain a basic understanding of Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,
2. Build and test circuits using power devices.
3. Build and test switching power supplies

10. Course Outcomes (COs):

At the end of this course students will demonstrate the ability to

1. Build and test circuits using power devices such as SCR
2. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,
3. Learn how to analyze these inverters and some basic applications.
4. Design SMPS.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Characteristics of Semiconductor Power Devices**

Thyristor, power MOSFET and IGBT- Treatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs (discrete and IC based).Concept of fast recovery and Schottky diodes as freewheeling and feedback diode.

Unit – 2	**Number of lectures =10**	**Controlled Rectifiers**

Single phase: Study of semi and full bridge converters for R, RL, RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.

Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper.

Unit – 3	**Number of lectures = 12**	**Single-phase inverters**

Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter.

Unit – 4	**Number of lectures = 12**	**Switching Power Supplies**

Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant converter - series loaded half bridge DC-DC converter. Applications: Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC

motor drive. P M Stepper motor Drive.
12. Brief Description of self learning / E-learning component
The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/ Journal papers; Patents in the respective field.
13. Books Recommended (3 Text Books + 2-3 Reference Books)
1. Muhammad H. Rashid, “Power electronics” Prentice Hall of India. 2. Ned Mohan, Robbins, “Power electronics”, edition III, John Wiley and sons. 3. P.C. Sen., “Modern Power Electronics”, edition II, Chand& Co. 4. V.R.Moorthi, “Power Electronics”, Oxford University Press. 5. Cyril W., Lander,” Power Electronics”, edition III, McGraw Hill.

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING				
2. Course Name	**Sensor and Architecture interfacing**	**L**	**T**	**P**
3. Course Code		3	0	0

4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	NIL	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical =**			

8. Brief Syllabus

This course deals with the different type of sensors, transducers and their interfacing with microcontrollers. This also describes their role to know the domain status. It also deals with the process to further processing of sensing elements.

9. Learning objectives:

- Educate students to understand the functioning of different types of sensors & their role in order to sense various parameters.
- To utilize the status of different signal parameters in the real time application to control the working.

10. **Course Outcomes (COs):**

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

1. Explain static and dynamic characteristics and operating principle of Inductive, capacitive, magnetic, piezo electric, radiation, electro chemical sensors.
2. Illustrate the importance of standard of calibration
3. Select suitable sensor for a given automobile, aeronautics, machine tools and manufacturing application

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Introduction**

Definition, Measurement Techniques, Classification of errors, Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors, Classification of sensors, calibration techniques.

Resistance, Inductance and Capacitance Transducers: Potentiometer, strain gauges, optical encoders, LVDT, RVDT, Synchro, Microsyn,

Applications: Pressure, position, angle and acceleration. Capacitance circuitry, Feedback type condenser microphone , frequency modulating oscillator circuit, Dynamic capacitance variation, A.C. Bridge for Amplitude Modulation, Applications: Proximity, microphone, pressure, displacement

Unit – 2	**Number of lectures =12**	**Piezoelectric & Magnetic Sensors**

Piezoelectric Materials and properties, Modes of deformation, Multi-morphs, Environmental effects, Applications: Accelerometer, ultrasonic. Magnetic Sensors, types, principle, requirement and advantages: Magneto resistive, Hall Effect – Eddy current.

Radiation and Electro Chemical Sensors: Photo conductive cell, photo voltaic, Photo resistive, Fiber optic sensors, Ray and Nuclear radiation sensors, Electro chemical sensors: Electrochemical cell, Polarization, sensor Electrodes and electro-ceramics in Gas Media.

Unit – 3	**Number of lectures = 10**	**Modern Sensors**

Film sensors, micro-scale sensors, Particle measuring systems, Vibration Sensors, SMART sensors, Machine Vision, Multi-sensor systems

Applications of Sensors: Applications and case studies of Sensors in Automobile Engineering, Aeronautics, Machine tools and Manufacturing processes.

Unit – 4	**Number of lectures = 08**	**Applications and architecture interfacing**

Interfacing of LEDs, 7 Segment display device, LCD display, DIP Switches, Push Button switches, Key denounce techniques, Keyboard connections load per key and matrix form, Interfacing A/D converter,

D/A converter, Relay, opto isolator stepper motor and DC motor.
12. Brief Description of self learning / E-learning component The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/ Journal papers; Patents in the respective field.
13. Books Recommended (3 Text Books + 2-3 Reference Books)
1. Patranabis D.," Sensor and Actuators", Prentice Hall of India (Pvt) Ltd., 2005. 2. Renganathan S.," Transducer Engineering", Allied Publishers (P) Ltd., 2003. 3. Ernest O. Doebelin, "Measurement systems Application and Design", International Student Edition, VI Edition, Tata McGraw-Hill Book Company, 2011. 4. Bradley D.A., and Dawson, Burd and Loader, "Mechatronics, Thomson Press India Ltd", 2004. 5. Bolton W, "Mechatronics", Thomson Press, 2003.

	Essence of Indian knowledge Traditional	**L**	**T**	**P**	**C**
Pre-requisites/Exposure		**2**	**0**	**0**	**0**

1. Name of the Department : Electronics and Communication Engineering				
14. Subject Name	**Antenna Design & Simulation lab**	**L**	**T**	**P**

15. Subject Code		0	0		2	
16. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
17. Pre-requisite (if any)	**Knowledge of Basic Algebra, Basic Electronics Lab**	**18. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

19. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	**Tutorials = 00**	**Practical = 10**

20. Brief Syllabus

The course introduces Boolean algebra, Reduction techniques and demonstrates the design of logic gates. Knowledge of digital systems design based on combinational and sequential logic is also imparted. This course further teaches about PLD, Memories and Logic Families.

21. **Course Objectives**

3. To be familiar with the most popular antenna design programs
4. To investigate the different parameters associated with the specific antenna.
5. To deal with various wire antennas, dipole, loop, helix … etc.
6. To get close to arrays and the different parameters that controls the shape of the pattern.
7. To design yagi antenna using designs graphs and software programs.
8. To investigate the high directional antennas such as Horn and Reflector antennas.

22. Course Outcomes

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

1. Demonstrate the structure and operation of various antennas and to describe their parameters.
2. Apply basic theorems to analyze the variation of field strength of radiated waves.
3. Measure the radiation pattern of wired, aperture, planar and array antennas.
4. Familiar with EM simulation tools to implement antenna prototypes.

23. List of Experiments

1. Study of the structure and operation of wired, aperture, planar and array antennas.
2. Proof of Inverse square law
3. Proof of Reciprocity theorem
4. Measurement of radiation pattern of all wired and aperture antennas
5. Measurement of radiation pattern of planar antennas
6. Measurement of radiation pattern of reflector antennas
7. Measurement of radiation pattern of array antennas
8. Analysis of co-polarization and cross polarization
9. Design and simulation of microstrip antenna using CST tool.
10. Measurement of antenna parameters using Network Analyzer.

24. **Brief Description of self learning / E-learning component**

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

25. Books Recommended (3 Text Books + 2-3 Reference Books)

1.Mano, Morris. "Digital logic." Computer Design. Englewood Cliffs Prentice-Hall (1979).

6. Kumar, A. Anand. Fundamentals of Digital Circuits 2Nd Ed. PHI Learning Pvt. Ltd., 2009.
7. Floyd, Thomas L. Digital Fundamentals, 10/e. Pearson Education India, 1986.
8. Malvino, Albert Paul, and Donald P. Leach. Digital principles and applications. McGraw-Hill, Inc., 1986.
9. Jain, Rajendra Prasad. Modern Digital Electronics 3e. Tata McGraw-Hill Education, 2003.

1. Name of the Department : Electronics and Communication Engineering				
2.Subject Name	**Digital Communication Lab**	**L**	**T**	**P**
3.Subject Code		0	0	2

4.Type of Course (use tick mark)		Core (√)	PE()		OE()	
5.Pre-requisite (if any)	Signals and Systems	10. Frequency (use tick marks)	Even ()	Odd (√)	Either Sem ()	Every Sem ()

6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	Tutorials = 00	Practical = 10

7.Brief Syllabus

The purpose of this lab is to explore digital communications with a software radio to understand how each component works together. The lab will cover, analog to digital conversion, modulation, pulse shaping, and noise analysis.

8.Course Objectives

1. To acquire Practical knowledge of each block in AM, FM transmitters and receivers.
2. To understand the concepts of baseband transmissions.

9.Course Outcomes

On completion of this course, the students will be able to

1. Analyze and design of various continuous wave and angle modulation and demodulation
2. Techniques understand the effect of noise present in continuous wave and angle modulation techniques.
3. Attain the knowledge about AM, FM Transmitters and Receivers
4. Analyze and design the various Pulse Modulation Techniques
5. Understand the concepts of Digital Modulation Techniques and Baseband transmission.

10.List of Experiments

1. Signal Sampling and reconstruction
2. Amplitude modulation and demodulation
3. Frequency modulation and demodulation
4. Pulse code modulation and demodulation.
5. Delta modulation, adaptive delta Modulation
6. Line Coding Schemes
7. BFSK modulation and Demodulation (Hardware(Kit based) & Simulation using MATLAB / SCILAB / Equivalent)
8. BPSK modulation and Demodulation (Hardware& Simulation using MATLAB/SCILAB/Equivalent)
9. FSK, PSK and DPSK schemes (Simulation)
10. Error control coding schemes (Simulation)
11. Spread spectrum communication (Simulation)
12. Communication link simulation
13. TDM and FDM

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.https://elearning.sgtuniversity.ac.in/course-category/

1. Name of the Department : Electronics and Communication Engineering

2.Subject Name	Digital Signal Processing Lab	L	T		P	
3.Subject Code		0	0		2	
4.Type of Course (use tick mark)		Core (√)	PE()		OE()	
5.Pre-requisite (if any)	Signals and Systems	11. Frequency (use tick marks)	Even ()	Odd (√)	Either Sem ()	Every Sem ()

6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	Tutorials = 00	Practical = 12

7.Brief Syllabus

Digital signal processing (DSP) is concerned with the representation of signals in digital form, and with the processing of these signals and the information that they carry.

8.Course Objectives

1. Understand the DSP concepts and to relate to real applications.
2. Time domain and frequency domain implementation.

9.Course Outcomes

On completion of this course, the students will be able to

1. Apply digital signal processing fundamentals.
2. To construct new experiment independently or as a team member.

10.List of Experiments

Perform the experiments using DSP Hardware Processor using Programs in C Language:

1. To understand sampling theorem & generation of waveforms like sine, square & Triangle.
2. To study Quantization technique.
3. To study PCM encoding & Hamming code generation.
4. To Study Digital modulation techniques ASK/FSK& PSK.
5. To study FIR Filter Implementation.
6. To study Auto correlation & linear convolution

Experiments to be performed on MATLAB

1. Represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To design analog filter (low-pass, high pass, band-pass, band-stop).
5. To design digital IIR filters (low-pass, high pass, band-pass, band-stop).
6. To design FIR filters using windows technique.

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

12.Books Recommended (3 Text Books + 2-3 Reference Books)

1. Oppenheim A.V., Schafer, Ronald W. & Buck, John R.,"Discrete Time Signal processing", Pearson Education , 2nd Edition.

Reference Books

1. De Fatta, D. J. Lucas, J. G. & Hodgkiss, W. S.," Digital Signal Processing", John Wiley & Sons.
2. Proakis, J.G. & Manolakis, D.G.," Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall of India.
3. Rabiner, L.R. and Gold B., "Theory and applications of DSP", Prentice Hall of India.

1. Name of the Department : Electronics and Communication Engineering

2.Subject Name	Major Project phase - II	**L**	**T**		**P**	
3.Subject Code		0	0		4	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	Minor Project	**12. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical =04**			

7.Brief Syllabus

Major projects are generally large-scale infrastructure projects in Engineering, environment and other sectors such as education, energy or ICT. They also concern big productive investments and research & development projects.

8.Course Objectives

The objectives of the Major Project Phase I include:

7. To give students the opportunity to apply the knowledge and skills they have acquired on campus into an idea that they want to developed.
8. To provide students with opportunities for practical, hands-on learning from practitioners in the students' areas of specialization.
9. To enhance the practical skills of the students so he becomes ready for work.

9.Course Outcomes

The learning outcomes can be as follows:

5. Apply theoretical knowledge in practical applications.
6. Acquire skills in communication, management and team work.

10.List of Experiments

Course contents:

9. The students are required to develop a product form the idea & knowledge he has.
10. Students will be allotted to a guide throughout the whole work for the guidance and supervision. .
11. The final Viva-voca of this will be conducted by the external examiner and one internal examiner appointed by the institute. External examiner will be from penal of examiner.
12. Assessment of this will be based on viva-voca, report and presentation of the work.

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.https://elearning.sgtuniversity.ac.in/course-category/

12.Books Recommended (3 Text Books + 2-3 Reference Books)

1. Name of the Department : Electronics and Communication Engineering						
2.Subject Name	**Industrial Training -II**	**L**	**T**		**P**	
3.Subject Code		0	0		0	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	**Courses up to 4th Sem**	**13. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical =00**			

7.Brief Syllabus

The Industrial Training indicates to a program which aims to provide a managed good practical training within a particular time frame. The main objectives of theindustrial training are to provide the best and relevant theoretical knowledge to gain in a particular time period.

8.Course Objectives

1. To gain first-hand experience of working as an engineering professional, including the technical application of engineering knowledge.
2. To experience the discipline of working in a professional organization and multidisciplinary team.
3. To develop technical, interpersonal and communication skills.

9.Course Outcomes

On completion of this course, the students will be able to get the structure of industry. He will know the various departments of industry & how industry works.

10. Course contents: After 4th semester & before 5th semester.

1. Duration for training should be 6 weeks.
2. It must be in Industry for study the working process & determine problems & propose solution.
3. Students have to submit to one spiral binding report & PPT presentation in internal examination.
4. Students have to submit three Hard binding report & PPT presentation in final end term examination

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

12.Books Recommended (3 Text Books + 2-3 Reference Books)

1. Name of the Department : Electronics and Communication Engineering						
2.Subject Name	**GL1 Lab**	**L**	**T**		**P**	
3.Subject Code		0	0		0	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	**Courses up to 4th Sem**	**14. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	**Tutorials = 00**	**Practical =00**

7.Brief Syllabus

A course covers the architectural description and programming of PIC microcontroller.

8.Course Objectives

The student will learn and understand

1. Basics of PIC microcontroller features.
2. Needs and significance of different peripherals for the development of applications
3. To testing the programming skills.

9.Course Outcomes

The students will be able to

1. Design & develop a PIC microcontroller based product prototype for an application.

10. Section A: Instrumentation & Measurement

List of Experiments:

1. Calibration of capacitive transducer for angular displacement.
2. Calibration of capacitive transducer for angular displacement.
3. Study of resistance temperature detector for temperature measurement.
4. Calibration of Pressure Gauges.
5. Calibration of strain gauge for temperature measurement.

Section B: PIC & programming

List of Experiments:

6. Interfacing of LEDs
7. Interfacing of Switches
8. Interfacing of Relays
9. Interfacing of LCD

Section C: Power Electronics

List of Experiments:

10. To study V-I characteristics of SCR and measure latching and holding currents.
11. To study UJT trigger circuit for half wave and full wave control.
12. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without freewheeling diode.
13. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and

inductive loads.

14. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.

Section D: Sensor & Architecture Interfacing

List of Experiments:

15. To study development tools/environment for ATMEL/PIC microcontroller program and Architecture.
16. Write an ALP to interface seven segment with 8051 and display 0-9 on it.
17. Write an ALP to interface DC Motor with 8051.
18. Write an ALP to interface 4x4 keyboards with 8051.
19. Write an ALP to interface temperature sensor using 8051.

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

12.Books Recommended (3 Text Books + 2-3 Reference Books)

	Digital Signal Processing Lab	L	T	P	C
Pre-requisites/Exposure	**Signals and Systems**	**0**	**0**	**2**	**1**

Course Objectives

3. Understand the DSP concepts and to relate to real applications.
4. Time domain and frequency domain implementation.

Course Outcomes

On completion of this course, the students will be able to

3. Apply digital signal processing fundamentals.
4. To construct new experiment independently or as a team member.

Course Description

Digital signal processing (DSP) is concerned with the representation of signals in digital form, and with the processing of these signals and the information that they carry.

List of Experiments:

Perform the experiments using DSP Hardware Processor using Programs in C Language:

1. To understand sampling theorem & generation of waveforms like sine, square & Triangle.
2. To study Quantization technique.
3. To study PCM encoding & Hamming code generation.
4. To Study Digital modulation techniques ASK/FSK& PSK.
5. To study FIR Filter Implementation.
6. To study Auto correlation & linear convolution

Experiments to be performed on MATLAB

1. Represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To design analog filter (low-pass, high pass, band-pass, band-stop).
5. To design digital IIR filters (low-pass, high pass, band-pass, band-stop).
6. To design FIR filters using windows technique.

Text Books

1. Oppenheim A.V., Schafer, Ronald W. & Buck, John R.,"Discrete Time Signal processing", Pearson Education , 2nd Edition.

Reference Books

1. De Fatta, D. J. Lucas, J. G. & Hodgkiss, W. S.," Digital Signal Processing", John Wiley & Sons.
2. Proakis, J.G. & Manolakis, D.G.," Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall of India.
3. Rabiner, L.R. and Gold B., "Theory and applications of DSP", Prentice Hall of India.

SGT UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM- 2019-2020
B. Tech. – VI Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
5		Microwave & Radar	3	0	0	3	40	60	100
6		VLSI Design	3	0	0	3	40	60	100
7		Program Elective-II	3	0	0	3	40	60	100
8		Program Elective-III	3	0	0	3	40	60	100
5		Open Elective- II	3	0	0	3	40	60	100
6		VA Course-II	2	0	0	0	40	60	100
7		Microwave & Radar Lab	0	0	2	1	40	60	100
8		VLSI Design Lab	0	0	2	1	40	60	100
9		Major Project phase -II	0	0	4	2	40	60	100
10		GL-II	0	0	2	1	40	60	100
11		GL-III	0	0	2	1	40	60	100
Total Contact Hours			**17**	**0**	**12**	**21**	**440**	**660**	1100
			29						

1. Name of the Department –ELECTRONICS & COMMUNICATION ENGINEERING

2. Subject Name	**Microwave & Radar**	**L –** 3	**T – 0**		**P -0**	
3. Subject Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Electromagnetic Field Theory	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 38		**Tutorials =0**	**Practical =0**			

8. Brief Syllabus

The above said subject is divided into 4 units. Unit I **Introduction to microwave communication and EM spectrum**. Unit II Signifpies study of Microwave Passive Circuits. Unit III Will be able to study generation of Microwave. Unit IV Analyze Microwave through Semiconductor Device.

9. Learning objectives: The students will learn and understand

1. Students will be able to study Microwave Propagation
2. Microwave Generation
3. Microwave Measurement

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Derive Microwave Equations in all modes
2. Will be able to study Microwave Tubes, Generation

11. Unit wise detailed content

Unit-1	**Number of lectures = 11**	**Introduction to microwave communication and EM spectrum**

Rectangular wave guide: Field Components, TE, TM Modes, Dominant TE10 mode, Field Distribution, Power, Attenuation. Circular waveguides: TE, TM modes. Wave velocities, Microstrip transmission line (TL), Coupled TL, Strip TL, Coupled strip line, Coplanar TL, Microwave cavities

Unit – 2	**Number of lectures = 8**	**Passive Microwave Devices:**

Scattering matrix, Passive microwave devices: Microwave hybrid circuits, Terminations, Attenuators, Phase Shifters, Directional couplers: Two-hole directional couplers, S- Matrix of a directional coupler, Hybrid couplers, Microwave propagation in ferrites, Faraday rotation, Isolators, Circulators. S-parameter analysis of all components

Unit – 3	**Number of lectures = 9**	**Microwave Tubes:**

Microwave tubes: Limitations of conventional active devices at microwave frequency, Two cavity Klystron, Reflex Klystron, Magnetron, Traveling wave tube, Backward wave oscillators, Gyro Devices: Their schematic, Principle of operation, Performance characteristic and their applications.

Unit – 4	**Number of lectures = 9**	**Solid state amplifiers and oscillators & Radar**

Transferred electron devices: Gunneffect diodes & modes of operation. Avalanche transit – time devices: IMPATT diode, TRAPPAT diode, BARITT diode.

Introduction and working of radar system.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

1. S.Y. Liao, Microwave Devices & Circuits; PHI 3rd Ed.

Reference Books:

1. A Das and S.K. Das, Microwave Engineering; McGraw Hill Education
2. S. Vasuki, D Margaret Helena, R Rajeswari, Microwave Engineering; MHE
3. M.I. Skolnik, Introduction to Radar Engineering ; TMH
4. Om P. Gandhi, Microwave Engineering and Applications; Pergamon Pres

<table>
<tr><td colspan="8">1. Name of the Department – ELECTRONICS & COMMUNICATION ENGINEERING</td></tr>
<tr><td colspan="2">2. Subject Name</td><td colspan="2">VLSI Design</td><td>L – 3</td><td colspan="2">T – 0</td><td>P -0</td></tr>
<tr><td colspan="2">3. Subject Code</td><td colspan="2"></td><td></td><td colspan="2"></td><td></td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (√)</td><td colspan="2">PE()</td><td colspan="2">OE()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td colspan="2">Analog Communication</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (√)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical</td></tr>
<tr><td colspan="3">Lectures = 40</td><td>Tutorials =</td><td colspan="4">Practical =</td></tr>
<tr><td colspan="8">8. Brief Syllabus
Course consists of Integrated circuit technology. It also comprises the analog VLSI and Digital VLSI design and also the fabrication technologies.</td></tr>
<tr><td colspan="8">9. Learning objectives: The student will learn and understand
1. The evolution of VLSI technologies for the development of Integrated circuit.
2. Design procedure of Analog and VLSI design and Digital VLSI design.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs): The students will be able to
1. Develop analog/Digital VLSI IC’s for the use of analog circuits in compact form.
2. Develop the semiconductor memories using VLSI technologies.</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td>Unit-1</td><td colspan="3">Number of lectures = 10</td><td colspan="4">Introduction to VLSI design</td></tr>
<tr><td colspan="8">Overview of VLSI; Basic of MOS: NMOS & PMOS operation, Threshold voltage, Body effect; MOS Device Design Equations & Basic DC equations;
Short Channel Effects: Scaling Theory, Threshold Voltage Variation, Mobility Degradation with Vertical Field, Velocity Saturation, Hot Carrier Effects.</td></tr>
<tr><td>Unit – 2</td><td colspan="3">Number of lectures = 8</td><td colspan="4">Analog VLSI Design</td></tr>
<tr><td colspan="8">Introduction to analog VLSI; Mixed signal issues in CMOS technologies; Basic MOS models, SPICE Models and frequency dependent parameters; CMOS analog blocks: Current Sources and Voltage references, MOSFET Amplifier, Differential amplifier, Oscillator using MOSFET, Frequency Synthesizers and Phased lock loop. Non-linear analog blocks: Comparators, Charge-pump circuits and Multipliers;</td></tr>
<tr><td>Unit – 3</td><td colspan="3">Number of lectures = 8</td><td colspan="4">Digital VLSI Design</td></tr>
<tr><td colspan="8">MOS as a Switch: NMOS, PMOS, CMOS; Combination: Series connection of NMOS/PMOS, Parallel connection of NMOS/PMOS; NMOS Technology: Need of Pull up resistor, Universal Gates design; PMOS: Universal Gates design; CMOS Technology: Logic gate design. Design of combinational device like adder, subs-tractor, Comparator, Multiplexer; Transmission Gate & Stick Diagram.</td></tr>
<tr><td>Unit – 4</td><td colspan="3">Number of lectures =14</td><td colspan="4">VLSI Fabrication Technology</td></tr>
<tr><td colspan="8">Core to wafer Journey; Fabrication Processes; Fabrication of different MOSFET devices: NMOSFET, PMOSFET, CMOSFET, Bi-CMOS; Fabrication of complex devices: CMOS Inverter, CMOS NAND gate, CMOS NOR gate;</td></tr>
<tr><td colspan="8">12. Brief Description of self-learning / E-learning component
The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.</td></tr>
<tr><td colspan="8">13. Books Recommended</td></tr>
<tr><td colspan="8">1. Design of Analog CMOS Integrated Circuits by B. Razavi, McGraw Hill.</td></tr>
</table>

1. Name of the Department – ELECTRONICS & COMMUNICATION ENGINEERING						
2. Subject Name	**Bio medical Electronics**	**L -** 3	**T – 0**		**P -0**	
3. Subject Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	Signals and Systems	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 40		**Tutorials =**	**Practical =**			

8. Brief Syllabus

Bio medical electronics (**BME**) is the application of engineering principles and design concepts to medicine and biology for healthcare purposes (e.g. diagnostic or therapeutic). This field seeks to close the gap between engineering and medicine, combining the design and problem solving skills of engineering with medical and biological sciences to advance health care treatment, including diagnosis, monitoring, and therapy. Biomedical engineering has only recently emerged as its own study, compared to many other engineering fields.

9. Learning objectives:

1. To study the working of different medical equipments

10. Course Outcomes (COs):

On completion of this course, the students will be able to

1. Introduce the student to the electronic devices and theory of operation in the medical area.
2. Electronic circuits for Biomedical Applications: Apply knowledge of engineering and science to understand the principle of biomedical electronic circuits. Understand how to apply, measure circuit performance, and solve problems in the areas of biomedical signals.
3. Work in Multi-disciplinary teams: Learn to work and communicate effectively with peers on multi-disciplinary teams to attain a common goal.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Introduction**

Introduction to the physiology of cardiac, nervous & muscular and respiratory systems. Transducers and Electrodes: Different types of transducers & their selection for biomedical applications. Electrode theory, selection criteria of electrodes & different types of electrodes such as, Ag - Ag Cl, pH, etc

Unit – 2	**Number of lectures = 10**	**Cardiovascular measurement**

Cardiovascular measurement: The heart & the other cardiovascular systems. Measurement of Blood pressure-direct and indirect method, Cardiac output and cardiac rate. Electrocardiography-waveform-standard lead systems typical ECG amplifier, phonocardiography, Ballisto cardiography, Cardiac pacemaker –defibrillator –different types and its selection.

Unit – 3	**Number of lectures = 10**	**EEG Instrumentation**

EEG Instrumentation requirements –EEG electrode –frequency bands – recording systems EMG basic principle-block diagram of a recorder –pre amplifier. Bed side monitor –block diagram- measuring parameters-cardiac tachometer-Alarms-Lead fault indicator-central monitoring. Telemetry – modulation systems – choice of carrier frequency – single channel telemetry systems.

Unit – 4	**Number of lectures =12**	**Clinical Laboratory**

Instrumentation for clinical laboratory: Bio electric amplifiers-instrumentation amplifiers isolation amplifiers-chopper stabilized amplifiers –input guarding - Measurement of pH value of Blood-blood cell counting, blood flow, Respiratory transducers and instruments.

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended :

1. J J Carr, "Introduction to Biomedical Equipment Technology": Pearson Education 4th e/d

Reference Books

1. K S Kandpur, "Hand book of Biomedical instrumentation", Tata McGraw Hill 2nd e/d.

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING						
2. Subject Name	**D.T Signal Processing**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Course (use tick mark)		✓ **Core ()**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Signal & Systems**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 38		**Tutorials = 00**	**Practical =**			

8. Brief Syllabus

This course deals with the basics of Electrical and Electronic measuring instruments used in laboratory and industry. In the process they learn different type of instruments like PMMC, Moving Iron, Electrodynamometer which includes voltmeter, ammeter, wattmeter, energy meter, power factor meter, frequency meter, Q meter, etc. Students will also learn about different AC and DC bridges to obtain various electrical parameters. Display devices which include DVM, CRO, and DSO etc are also learnt to analyze electrical signals in the course.

9. Learning objectives:

1. To introduce various techniques of digital signal processing that are fundamental to various industrial applications.
2. To know third generation DSP architectures and interfacing of memory and I/O peripherals to the DSP processors.

10. Course Outcomes:

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

1. Design IIR and FIR filters
2. Apply adaptive filters appropriately in communication systems.

11. Unit wise detailed content

Unit-1	**Number of lectures = 13**	**Discrete Fourier Transform**

Analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) deriving DFT from DTFT, properties of DFT periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences overlap save and overlap add method. Fast computation of DFT Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transforms (FFT), Linear filtering using FFT.

Unit - 2	**Number of lectures = 05**	**Infinite Impulse Response Filters**

Characteristics of practical frequency selective filters, Characteristics of commonly used analog filters Butterworth filters, Chebyshev filters, Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) Approximation of derivatives, Impulse invariance method, Bilinear transformation, Frequency transformation in the analog domain, Structure of IIR filter direct form I, direct form II, Cascade, parallel realizations.

Unit - 3	**Number of lectures = 08**	**Finite Impulse Response Filters**

Design of FIR filters, symmetric and Anti-symmetric FIR filters, design of linear phase FIR filters using Fourier series method, FIR filter design using windows (Rectangular, Hamming & Hanning window), Frequency sampling method, FIR filter structures, linear phase structure, direct form realizations.

Unit - 4	**Number of lectures =**	**Finite Word Length Effects**

	08	

Fixed point and floating point number representation, ADC, quantization, truncation and rounding, quantization noise, input / output quantization, coefficient quantization error, product quantization error, overflow error, limit cycle oscillations due to product quantization and summation, scaling to prevent overflow.

12. Brief Description of self learning / E-learning component

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Journal papers; Patents in the respective field.

13. Books Recommended

Text Book

1. John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007. (UNIT I – V)

References

1. Emmanuel C. Ifeachor & Barrie. W. Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002.

1.	**Name of the Department-ELECTRONICS & COMMUNICATION ENGINEERING**				
2.	**Subject**	**Scientific**	**L**	**T**	**P**

Name	**computing**					
3. Subject Code		3	0		0	
4. Type of Course (use tick mark)		✓ **Core ()**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 40		**Tutorials = 00**	**Practical =**			

Brief Syllabus:

Course consists of PIC microcontroller & their family members architectures and features as well. It also covers the development of PIC based projects for any applications.

8. Learning objectives:

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

9. Course Outcomes

Upon completion of the course, the student are expected to

1. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
2. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
3. Reveal different applications of these models to solve engineering and other problems.

10. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Introduction:**

Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy.

Computer Arithmetic: Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating-Point Arithmetic, Cancellation

Unit - 2	**Number of lectures = 10**	**System of liner equations:**

Linear Systems, Solving Linear Systems, Gaussian elimination, Pivoting, Gauss-Jordan, Norms and Condition Numbers, Symmetric Positive Definite Systems and Indefinite System, Iterative Methods for Linear Systems

Linear least squares: Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting

Eigenvalues and singular values: Eigenvalues and Eigenvectors, Methods for Computing All Eigenvalues, Jacobi Method, Methods for Computing Selected Eigenvalues, Singular Values Decomposition, Application of SVD

Unit - 3	**Number of lectures = 10**	**Nonlinear equations:**

Fixed Point Iteration, Newton's Method, Inverse Interpolation Method Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares Interpolation: Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation. Numerical Integration and Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation, Initial Value Problems for ODES, Euler's Method, Taylor Series Method, Runga-Kutta Method, Extrapolation Methods, Boundary Value Problems For ODES, Finite Difference Methods, Finite Element Method, Eigenvalue Problems

Unit - 4	**Number of lectures = 10**	Partial Differential:

Equations,Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods. Fast Fourier Transform, FFT Algorithm, Limitations, DFT, Fast polynomial Multiplication, Wavelets,Random Numbers And Simulation, Stochastic Simulation, Random Number Generators, Quasi-Random Sequences

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

12. Books Recommended

Text Books:

1. Heath Michael T., "Scientific Computing: An Introductory Survey", McGraw-Hill, 2nd Ed., 2002

References Books

2. Press William H., Saul A. Teukolsky, Vetterling William T and Brian P. Flannery, "Numerical Recipes: The Art of Scientific Computing", Cambridge University Press, 3rd Ed., 2007
3. Xin-she Yang PIC microcontroller by Peatman Microchip technologies Datasheet

14. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING							
15. Subject Name	**Information & Communication Theory**	**L**	**T**		**P**		
16. Subject Code		3	0		0		
17. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**		
18. Pre-requisite (if any)	NIL	**19. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()	
20. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures = 42		**Tutorials = 0**	**Practical =**				

21. Course Description

The Lab subject basically deals with the different aspects of a signal and spectra. It also deals with the modulation of signals and different mathematical aspects related to signals. It gives a more analytical look into the basic entities such as those of signals, modulation, noise etc. which form the base for higher studies in telecommunication.

22. Learning objectives:

3. Concepts of communication engineering.
4. Different analog modulation techniques used.

23. Course Outcomes (COs):

3. Understand different modulation and demodulation techniques.
4. Develop the ability to compare and contrast the strengths and weaknesses of various modulation techniques.

24. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Information Theory:**

Information measure and source coding, Information measure, Entropy and Information rate, Coding for a discrete memory less source, Predictive coding for sources with memory, Information transmission on discrete channels, Mutual information.

Unit – 2	**Number of lectures =10**	**Coding Theory:**

Information measure and source coding, Information measure, Entropy and Information rate, Coding for a discrete memory less source, Predictive coding for sources with memory, Information transmission on discrete channels, Mutual information.

Unit – 3	**Number of lectures = 12**	**Codes used in Information Theory:**

Discrete channel capacity, coding for the binary symmetric channel, Continuous channels and system comparisons, continuous information, continuous channel capacity, Ideal communication system, system comparisons.

Unit – 4	**Number of lectures = 12**	**Performance of codes:**

Sequential Decoding of Convolution codes, Trellis codes, Applications , Algebraic codes, Burst error correcting, Parity check bit coding for error detection, comparison of error rates in coded and un coded

transmission, Automatic repeat request.

25. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

26. Books Recommended (3 Text Books + 2-3 Reference Books)

Text Books:

1. Blahut R.E., Theory and practice of error control codes, AWL1983.

Reference Books:

1. Wilson, Digital Modulation and coding, Pearson
2. B.P. Lathi, Communication System, Oxford
3. Ranjan Bose, Information Theory, Coding & Cryptography, TMH
4. J. Dass. , S.K. Malik & P.K. Chatterjee, Principles of digitals communication.

14. Name of the Department- ELECTRONICS & COMMUNICATION

ENGINEERING							
15. Subject Name	**Device Modelling**	**L**	**T**	**P**			
16. Subject Code		3	0	0			
17. Type of Course (use tick mark)		**Core (✓)**	**PE()**	**OE()**			
18. Pre-requisite (if any)	**Semiconductor Physics & Electronic Devices**	**19. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()	
20. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures = 42		**Tutorials = 0**	**Practical =**				

21. Course Description

The course covers basic of semiconductor materials, their physical & chemical properties. It also cover the characteristics & uses of these semiconductor materials in different devices so they can perform better.

22. Learning objectives:

1. Understanding the characteristics of various semiconductor materials and their expected application.
2. Development of various structural device for the replacement of existing for better performance.

23. **Course Outcomes (COs):**

On completion of this course, the students will be able to

1. To restructure existing electronic component to improve the performance.
2. To propose new devices by replacing the existing materials used in different region in the devices.

24. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Introduction**
Basic Device Physics: Electrons and holes in silicon, p-n junction, MOS capacitor, High field effects.		
Unit – 2	**Number of lectures =12**	**Device Physics**
Basic Device Physics: Electrons and holes in silicon, p-n junction, MOS capacitor, High field effects.		
Unit – 3	**Number of lectures = 10**	**CMOS**
CMOS Performance Factors: Basic CMOS circuit elements, parasitic elements, Sensitivity of CMOS delay to device parameters, Performance factors of advanced CMOS devices.		
Unit – 4	**Number of lectures = 08**	**Bipolar Devices**
Bipolar Devices: n-p-n Transistors, Ideal current-voltage characteristics, Characteristics of a typical n-p-n transistor, Bipolar device models for circuit and time-dependent analyses, Breakdown voltages. Bipolar. Device Design: Design of the emitter design, Design of the base region, Design of the collector design, Modern bipolar transistor structures.		

25. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

26.	Books Recommended

Text Book

1. Yuan Taur, Tak.H.Ning, Fundamentals of Modern VLSI Devices, Cambridge University Press,

Reference Books

1. Donald Neamen, Semiconductors Physics and Devices, Tata Mc Graw Hill, 2003
2. Tyagi, Introduction to Semiconductor Materials and Devices, Wiley Publications, 2002.
3. S.M. Sze (Ed), Physics of Semiconductor Devices, 2nd Edition, Wiley Publications, 1998

1.	Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING

2. Subject Name	**Control Systems**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Measurement & Instrumentation, Signals & System**	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)

Lectures = 42	**Tutorials = 0**	**Practical =**

8. Course Description

Study of analog and computer controlled systems, classical and modern control system design methods, state space, dynamics of linear systems, and frequency domain analysis and design techniques. Analysis of linear feedback systems, their characteristics, performance, and stability

9. Learning objectives:

The students will learn and understand

1. Methodology for modeling mechanical, electrical, and other types of dynamic systems using both frequency domain and state-space techniques.
2. Principles of feedback control to a variety of scientific disciplines

10. **Course Outcomes (COs):**

On completion of this course, the students will be able to

1. Know the methodology for modeling dynamic systems
2. Work with state-space models and their application to frequency domain models.
3. Design feedback controllers and compensators to achieve desired performance specifications.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Introduction to Control System**

Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, and Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback.

Unit – 2	**Number of lectures =12**	**Time Response analysis**

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants, Steady state Accuracy, Transient Accuracy, Disturbance, Rejection, Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems.

Unit – 3	**Number of lectures = 10**	**Concept of Stability & Algebraic Criteria**

Concept of Stability, Necessary condition for Stability, Routh Hurwitz Stability Criterion, Relative Stability Analysis, and Stability of Systems modeled in State variable form. Root locus concepts, its construction, Root contours, Sensitivity of roots of Characteristic equations.

Unit – 4	**Number of lectures = 08**	**Frequency response Analysis**

Polar and inverse polar plots, Bode plots, Stability in Frequency Domain: Nyquist stability criterion; assessment of relative stability: gain margin and phase margin; Nichols Charts; **Introduction to Design of control systems:** lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain. Review of state variable technique: State Models for Linear continuous Time systems, State Variables for linear discrete time, Conversion of state variable model to transfer function model and vice-versa, Controllability and observability and their testing.

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

13. Books Recommended

Text Books

1. Nagrath & Gopal, "Control System Engineering", 4th Edition, New age International, ISBN: 0130980412. 8.

Reference Books

1. Norman S. Mise, Control System Engineering 4th edition, Wiley Publishing Co, ISBN: 0132273071.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India, 3rd edition ISBN: 0132273071

1. Name of the Department : Electronics and Communication Engineering

26. Subject Name	**ARM Controller**	**L**	**T**		**P**	
27. Subject Code		3	0		0	
28. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
29. Pre-requisite (if any)	**Knowledge of Digital electronics, Microcontroller Architecture and Programming**	**30. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

31. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	**Tutorials = 00**	**Practical = 10**

32. Brief Syllabus

The course introduces ARM Embedded Systems and ARM Processor Fundamentals. Knowledge of ARM Instruction Set is also imparted. This course further teaches about ARM Programming, Exception and Interrupt handling schemes.

33. **Course Objectives:**

1. Collect knowledge of architecture of ARM 7processor, LPC2148 and assembly programming of ARM.
2. Learn to design, construct, program, verify, analyze and troubleshoot ARM assembly and C language programs and supporting hardware.

34. Course Outcomes

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

1. Understand the features of embedded systems, architecture of ARM7 and applications.
2. Analyse and understand the instruction set and development tools of ARM

5.

14. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**ARM Embedded Systems and ARM Processor Fundamentals**

The RISC design philosophy, ARM design philosophy, embedded system hardware- AMBA bus protocol, embedded system software- applications. ARM core data flow model, Registers, CPSR-Processor modes, Banked registers. Pipeline- Characteristics

Unit – 2	**Number of lectures =12**	**ARM Instruction Set**

Fundamentals of ARM instructions, Barrel shifter, Classification and explanation of instructions with examples-Data processing, Branch, Load-store, SWI and Program Status Register instruction.

Unit – 3	**Number of lectures = 10**	**ARM Programming, Exception and Interrupt handling schemes**

Differences between ARM and THUMB, Register usage in Thumb, ARM Thumb Interworking. General Structure of ARM assembly module, Assembler directives- AREA, ENTRY, END, SPACE, DCD, DCB, DCW, DCI, DCQ, EQU, EXPORT, ALIGN, CODE16, CODE32, DATA. Simple ALP programs on Arithmetic & logical operations, Factorial, string operation, sorting, searching, and Scan.

Exception handling- ARM processor exceptions and modes, vector table, exception priorities, link register offsets. Interrupts- assigning interrupts, interrupt latency, IRQ and FIQ exceptions with example- code for enabling and disabling IRQ and FIQ exceptions, Comparison between exception and interrupts. Interrupt handling schemes- nested interrupt handler, non-nested interrupt handler. Basic interrupt stack design.

Unit – 4	**Number of**	**LPC2148 ARM CPU, LPC 2148 – Peripherals**

	lectures = 08	

LPC 2148 - Salient features, applications, memory mapping. Interrupt controller, RTC, USB, UART, I2C, SPI, SSP controllers, watch dog timers and other system control units.
LPC 2148 – Peripherals: Pin Connect Block- Features, Register description with example. GPIO- Features, Applications, Pin description, Register description with examples PLL-Features, block diagram, bit structure of PLLCON, PLLCFG, & PLLSTAT, and PLLFEED. PLL frequency Calculation- procedure for determining PLL settings, examples for PLL Configuration Timers-Features, applications, Architecture of timer module, register description, Simple C programs for application using -GPIO, PLL, Timer.

15. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

16. Books Recommended

Text Books

1. ARM System Developer's guide –Andrew N. SLOSS, ELSEVIER Publications, 2016.

Reference Books

1. ARM Assembly Language – William Hohl, CRC Press, ISBN:978-81-89643-04-1
2. ARM System-on-chip Architecture by Steve Furber, Pearson Education,
3. LPC 2148 USER MANUAL
4. IN SIDE R'S GUIDE TO PHILIPS ARM7 BASED MICROCONTROLLERShitex.co.uk
5. ARM Programming Techniques – from ARM website
6. Embedded Systems: A Contemporary Design Tool- James K. PeckolISBN: 978-0-471- 72180-2 October 2007, ©2008

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING

2. Subject Name	**Speech Processing & Recognition**	**L**	**T**		**P**	
3. Subject Code		3	0		0	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Signal Processing**	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)

Lectures = 42	**Tutorials = 0**	**Practical =**

8. Course Description

It deals with background material in the acoustic theory of speech production, acoustic-phonetics, and signal representation. It describes algorithmic aspects of speech recognition systems including pattern classification, search algorithms, stochastic modelling, and language modelling techniques. It compares and contrasts the various approaches to speech recognition, and describes advanced techniques used for acoustic-phonetic modelling, robust speech recognition etc.

9. Learning objectives:

The students will learn and understand

1. To enable students to master the state-of-the-art theories and technologies behind various speech related products and services, such as mobile phones, voice search, voice over IP, Internet phones, directory services, and voice biometrics.

10. **Course Outcomes (COs):**

On completion of this course, the students will be able to

1. Master the fundamental principles behind voice-enable products and services;
2. Know what the current state-of-the-art speech technologies can offer;
3. Take the limitations of current speech technologies into consideration when deploying voice-enabled services
4.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Production And Classification of Speech Sounds**

Introduction, mechanism of speech production, Acoustic phonetics: vowels, diphthongs, semivowels, nasals, fricatives, stops and affricates.

Unit – 2	**Number of lectures =12**	**Time-Domain Methods For Speech Processing**

Time dependent processing of speech, short-time energy and average magnitude, short-time average zero crossing rates.

Speech vs. silence detection- Speech vs. silence detection, pitch period estimation using parallel processing approach, short-time autocorrelation function.

Unit – 3	**Number of lectures = 10**	**Frequency Domain Methods for Speech Processing**

Introduction, definitions and properties: Fourier transforms interpretation and linear filter interpretation,

sampling rates in time and frequency.		
Unit – 4	**Number of lectures = 08**	**APPLICATIONS OF SPEECH PROCESSING**
Brief applications of speech processing in voice response systems hearing aid design and recognition systems		

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

13. Books Recommended

Text Books

1. M.W. Mak and J.T. Chien, "Machine Learning for Speaker Recognition", Cambridge University Press, 2019.

Reference Books

1. Y. LeCun, Y. Bengio and G.E. Hinton, "Deep Learning", Nature, vol. 521, pp. 436-444, May 2015.
2. T. Kinnunen and H. Z. Li, "An overview of text-independent speaker recognition: From features to supervectors," Speech Communication, 2010.
3. J.R. Deller, J.G. Proakis, and J.H.L. Hansen, Discrete-Time Processing of Speech Signals, Macmillan Pub. Company, 2000.
4. L.R. Rabiner and B.H. Juang, Fundamentals of Speech Recognition, Prentice Hall, 1993.

1. Name of the Department : Electronics and Communication Engineering				
2. Subject	**Wireless Sensor**	**L**	**T**	**P**

Name	**Network**					
3. Subject Code		3	0		0	
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Sensors & Transducers**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 10**			

8. Brief Syllabus

This course provides a broad coverage of challenges and latest research results related to the design and management of wireless sensor networks. Covered topics include network architectures, node discovery and localization, deployment strategies, node coverage, routing protocols, medium access arbitration, fault-tolerance, and network security.

9. **Course Objectives:**

Wide range of applications such as disaster management, military and security have fuelled the interest in sensor networks during the past few years. Sensors are typically capable of wireless communication and are significantly constrained in the amount of available resources such as energy, storage and computation. Such constraints make the design and operation of sensor networks considerably different from contemporary wireless networks, and necessitate the development of resource conscious protocols and management techniques.

10. Course Outcomes

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

By the completion of the course, you should be able to:

1. Architect sensor networks for various application setups.
2. Explore the design space and conduct trade-off analysis between performance and resources.
3. Assess coverage and conduct node deployment planning.
4. Devise appropriate data dissemination protocols and model links cost.
5. Determine suitable medium access protocols and radio hardware.
6. Prototype sensor networks using commercial components.
7. Provision quality of service, fault-tolerance, security and other dependability requirements while coping with resource constraints.
8. Evaluate the performance of sensor networks and identify bottlenecks.

17. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Applications and Design Model**
Examples of available sensor nodes, Sample sensor networks applications, Design challenges, Contemporary network architectures, Operational and computational models, Performance metrics, Software and hardware setups.		
Unit – 2	**Number of lectures =12**	**Network Bootstrapping**
Sensor deployment mechanisms, Issues of coverage, Node discovery protocols, Localization schemes, Network clustering,		
Unit – 3	**Number of lectures = 10**	**Data dissemination and routing**
Query models, In-network data aggregation, robust route setup, coping with energy constraints,		
Unit – 4	**Number of lectures = 08**	**Physical and Link layers & Dependability Issues**
Radio energy consumption model, Power management, Medium access arbitration, Optimization		

mechanisms;
Dependability Issues: Security challenges, Threat and attack models, Quality of service provisioning, Clock synchronization, Supporting fault tolerant operation

18. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

19. Books Recommended

Text Books

1. Protocols and Architectures for Wireless Sensor Networks;
Holger Karl, Technical University of Berlin,, Andreas Willig, University of Potsdam, Wiley, ISBN: 0-470-09510-5, June 2005

1.	**Name of the Department : Electronics and Communication Engineering**			
2. Subject	**Digital System design with**	**L**	**T**	**P**

Name	**Programming logic**					
3. Subject Code		3	0		0	
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Digital Design**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 10**			

8. Brief Syllabus

The VHSIC Hardware Description Language (VHDL) is an industry standard language used to describe hardware from the abstract to the concrete level. VHDL usage has risen rapidly since its inception and is used by literally tens of thousands of engineers around the globe to create sophisticated electronic products.

9. **Course Objectives:**

1. To gain an in-depth understanding of VHDL and to realize different circuits using it both sequential and combinational.
2. To gain an understanding of applications of VHDL in PLDs and Field Programmable Logic Arrays (FPGAs).

10. Course Outcomes

On completion of this course, the students will be able to

1. Explain VHDL as a programming language.
2. Gain proficiency with VHDL software package and utilize software package to solve problems on a wide range of digital logic circuits.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Introduction**

Introduction to Hardware Description Languages (HDL) and HDL based design, VHDL- Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, VHDL model for a counter.

Unit – 2	**Number of lectures =12**	**VHDL Synthesis and Models**

Attributes, Transport and Inertial delays, Operator overloading, Multivalued logic and signal resolution, IEEE-1164 standard logic, Generics, Generate statements, Synthesis of VHDL code, Synthesis examples, Files and TEXTIO. Introduction to data path and control path synthesis.

Unit – 3	**Number of lectures = 10**	**Digital Design with State Machine Charts**

State machine charts, Derivation of SM charts, Realization of SM charts. Implementation of the dice game, Alternative realization for SM charts using microprogramming, linked state machines, Asynchronous state machine based design.

Unit – 4	**Number of lectures = 08**	**Programmable Logic devices (PLDs)**

Designing With Programmable Logic Devices: Read-only memories (ROM, EPROM, EEPROM/FLASH), Programmable logic arrays (PLAs), Programmable array logic (PLAs), other sequential programmable logic devices (PLDs), Design of a keypad scanner.

Design Of Networks For Arithmetic Operations: Design of a serial adder with accumulator, State graphs for control networks, Design of a binary multiplier, Multiplication of signed binary numbers, Design of a binary divider.

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

13. Books Recommended

Text Books

1. Stephen Brown and Zvonko Vranesic," Fundamentals of Digital Logic with VHDL Design", Mc-Graw-Hill (2nd edition).*ISBN*-10: 0077211642

Reference Books

1. Peter J. Ashenden, "Designers guide to VHDL ", Morgan Kaufman Publishers. 3rd edition, *ISBN*-10: 0120887851

Open Elective - II

VA course - II

1. Name of the Department : Electronics and Communication Engineering

2.Subject Name	**Microwave & Radar Lab**	**L**	**T**		**P**	
3.Subject Code		0	0		2	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	**Electromagnetic Fields and waves.**	**1. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	**Tutorials = 00**	**Practical = 10**

7.Brief Syllabus

A key part of the microwave laboratory experience is to learn how to use microwave test equipment to make measurements of power, frequency, S parameters, SWR, return loss, and insertion loss. We are fortunate to have a very well-equipped microwave laboratory, but most of the equipment is probably not familiar to students. Here we briefly describe the most important pieces of test equipment that will be used in the laboratory experiments.

8.Course Objectives

1. Know about the behavior of microwave components.
2. Understand the radiation pattern of horn antenna.

9.Course Outcomes

On completion of this course, the students will be able to

1. Demonstrate the characteristics of Microwave sources
2. Demonstrate the characteristics of directional Couplers
3. To test the characteristics of microwave components
4. To analyze the radiation pattern of antenna
5. To measure antenna gain
6. Practice microwave measurement procedures

10.List of Experiments

1. To study microwave test bench.
2. To study the characteristics of reflex klystron tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular waveguide working on TE01 mode. 4. To study measurement of reflection coefficient and standing wave ratio using double minima method.
5. To study V-I characteristic of Gunn diode.
6. To measure an unknown impedance with Smith chart.
7. Study of Circulator/Isolator.
8. Study of Attenuator (Fixed and Variable type).
9. To study simple dipole ⁄ antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
10. To study folded dipole antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
11. To study ⁄ phase array end-fire antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
12. To study broadside array antenna and to calculate beam-width, front / back ratio, and gain of the antenna.

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant

lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

12.Books Recommended

1. James Wigle, Microwave Engineering Laboratory Manual, 3rd Edition, ISBN-10: 1105690377, ISBN-13: 978-1105690372

1. Name of the Department : Electronics and Communication Engineering

2.Subject Name	**VLSI Design Lab**	**L**	**T**		**P**	
3.Subject Code		0	0		2	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	**Digital Design**	**2. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 12**			

7.Brief Syllabus

A course in VLSI design laboratory will provide a practical knowledge for the implementation of analog and digital VLSI circuits.

8.Course Objectives

The student will learn and understand

1. Transistor-Level CMOS Logic Design.
2. Estimation and Optimization of combinational circuits.

9.Course Outcomes

On completion of this course, the students will be able to

1. Create models of moderately sized CMOS circuits that realize specified digital functions.

10.List of Experiments

1. Design the schematic for the different logic gates using NMOS technology.
2. Design the different adder circuits using NMOs technology.
3. Design the schematic for the different logic gates using CMOS technology.
4. Design the different adder circuits using CMOS technology.
5. Do the Transient, AC & DC analysis for the NMOS & CMOS Logic Gates.
6. Do the Transient, AC & DC analysis for the NMOS & CMOS full adder.
7. Design the 4bit parallel adder using CMOS Technology & determine its simulation result for transient analysis.
8. Design the layout for Universal logic gates using NMOS Technology.
9. Design the layout for Half Adder using CMOS Technology.
10. Design the layout for 4bit parallel adder using CMOS Technology.
11. Design the counter using CMOS technologies.
12. Design the shift registers for CMOs technologies & analysis their function. 4 bit
13. Design the different digital IC's for different technologies like 180nanometer, 100 micrometer etc.

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portalhttps://elearning.sgtuniversity.ac.in/course-category/

12.Books Recommended :

Text Book:

1. Sung-Mo Kang & Yusuf Leblebici, "CMOS Digital Integrated Circuits – Analysis and Design", 3rd Edition, Tata McGraw-Hill, New Delhi, 2003.

1. Name of the Department : Electronics and Communication Engineering

2.Subject Name	Major Project phase - II	**L**	**T**		**P**	
3.Subject Code		0	0		4	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	Minor Project	**3. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	**Tutorials = 00**	**Practical =04**

7.Brief Syllabus

Major projects are generally large-scale infrastructure projects in Engineering, environment and other sectors such as education, energy or ICT. They also concern big productive investments and research & development projects.

8.Course Objectives

The objectives of the Major Project Phase I include:

1. To give students the opportunity to apply the knowledge and skills they have acquired on campus into an idea that they want to developed.
2. To provide students with opportunities for practical, hands-on learning from practitioners in the students' areas of specialization.
3. To enhance the practical skills of the students so he becomes ready for work.

9.Course Outcomes

The learning outcomes can be as follows:

7. Apply theoretical knowledge in practical applications.
8. Acquire skills in communication, management and team work.

10.List of Experiments

1. The students are required to develop a product form the idea & knowledge he has.
2. Students will be allotted to a guide throughout the whole work for the guidance and supervision. .
3. The final Viva-voca of this will be conducted by the external examiner and one internal examiner appointed by the institute. External examiner will be from penal of examiner.
4. Assessment of this will be based on viva-voca, report and presentation of the work.

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal https://elearning.sgtuniversity.ac.in/course-category/

12.Books Recommended (3 Text Books + 2-3 Reference Books)

1. Name of the Department : Electronics and Communication Engineering

2.Subject Name	**GL-II Lab**	**L**	**T**		**P**	
3.Subject Code		0	0		2	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	**Bio-Medical Instrumentation, Digital Processor, Scientific Computing and Information Theory & Coding.**	**4. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	**Tutorials = 00**	**Practical =00**

7.Brief Syllabus

A course covers the Bio-Medical Instrumentation, Digital Processor, Scientific Computing and Information Theory & Coding.

8.Course Objectives

The student will learn and understand

4. Basics of Bio-Medical Instrumentation, Digital Processor, Scientific Computing and Information Theory & Coding.
5. Needs and significance of different peripherals for the development of applications
6. To testing the programming skills.

9.Course Outcomes

The students will be able to

2. Design & develop a PIC microcontroller based product prototype for an application.

Perform Bio-Medical Instrumentation experiments.

10. Section A: Bio-Medical Instrumentation

List of Experiments:

1. Blood Pressure Measurement
2. Real time monitoring of Echocardiography
3. Working of different types of Diathermy equipments – study

i. Shortwave Diathermy ii. Ultrasound Diathermy iii. Surgical Diathermy

4. ECG wave analysis using simulator
5. Real time patient monitoring system

Section B: Digital Processor

List of Experiments:

1. Computation of N- Point DFT of a Given Sequence
2. Implementation of FFT of Given Sequence
3. Power Spectrum
4. Implementation of LP FIR Filter for Given Sequence & Implementation of HP FIR Filter for Given Sequence
5. Implementation of LP IIR Filter for Given Sequence & Implementation of HP IIR Filter for Given Sequence

Section C: Scientific Computing

List of Experiments:

1. Study of Introduction to MATLAB
2. Study of basic matrix operations
3. To solve linear equation
4. Solution of Linear equations for Underdetermined and Over determined cases.
5. Determination of Eigen values and Eigen vectors of a Square matrix. 6. Solution of Difference Equations.

Section D: Information Theory & Coding

List of Experiments:

1. Applied the encoding.
2. Discrete entropy for probability
3. Implement entropy for parts of message.
4. Compute the entropy of message/text
5. Noiseless (no noise) binary channel
6. Binary symmetric channel bsc capacity
7. Binary symmetric channelcapacity: private case
8. Shannon-fano code algorithm
9. The huffman-coding algorithm

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal https://elearning.sgtuniversity.ac.in/course-category/

12.Books Recommended (3 Text Books + 2-3 Reference Books)

1. Name of the Department : Electronics and Communication Engineering

2.Subject Name	**GL-III**	**L**	**T**		**P**	
3.Subject Code		0	0		2	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	**Control System, ARM Processor, Speech processing & Recognition, Wireless sensor Network and DSD with programmable logic**	**5. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 00	**Tutorials = 00**	**Practical =00**

7.Brief Syllabus

The Industrial Training indicates to a program which aims to provide a managed good practical training within a particular time frame. The main objectives of the industrial training are to provide the best and relevant theoretical knowledge to gain in a particular time period.

8.Course Objectives

The student will learn and understand

7. Basics of PIC microcontroller features.
8. Needs and significance of different peripherals for the development of applications
9. To testing the programming skills.

9.Course Outcomes

On completion of this course, the students will be able to get the structure of industry. He will know the various departments of industry & how industry works.

10. Course contents:

A course covers the Bio-Medical Instrumentation, Digital Processor, Scientific Computing and Information Theory & Coding.

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/

12.Books Recommended (3 Text Books + 2-3 Reference Books)

SGT UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM- 2019-2020
B. Tech. – VII Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1		Wireless Communication	3	0	0	3	40	60	100
2		Program Elective-IV	3	0	0	3	40	60	100
3		Open Elective III	3	0	0	3	40	60	100
4		Open Elective IV	3	0	0	3	40	60	100
5		Professional Ethics for Electronics Engineers	2	0	0	2	40	60	100
6		Review Article Phase-I	0	0	6	3	40	60	100
7		Wireless Communication Lab	0	0	2	1	40	60	100
9		Industrial Training – III	0	0	0	1	40	60	100
10		GL-IV	0	0	2	1	40	60	100
Total Contact Hours			**14**	**0**	**10**	**20**	**400**	**600**	1000
			24						

Program Elective-IV	
	Computational Electromagnetic
	DIP with simulation
	IoT Architecture
	RF VLSI

1. Name of the Department –ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**Wireless Communication**	**L –** 3	**T – 1**		**P -0**	
3.Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Digital Communication**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 38		**Tutorials =0**	**Practical =0**			

8. Brief Syllabus

This course deals with spectrum allocation in a cell and design of cell size. It focuses on the architecture of advanced cellular technology. The learners will be in a position to appreciate the advantages and limitations of RF wireless as a medium of communication. After the course students will be in a position to understand the wireless communication abnormalities in data and voice receptions and will be able to provide possible solutions to overcome such abnormalities.

9. Learning objectives:

1. Educate students to understand the bandwidth of operation of cellular technology and plan spectrum deployment for cellular systems to provide better customer services as well as earn revenue of service provider
2. Apply the mobile and wireless principles for creating solutions for data and voice communication in various Industries like Banking, Marketing and Automobile.

10. Course Outcomes (COs):

On completion of this course, the students will be able to

1. Design a cellular system in a specific radio and geographic environment with specific frequency range
2. Solve numerical problems pertaining to cell design, GSM and CDMA (IS 95) system designs

11. Unit wise detailed content

Unit-1	**Number of lectures = 8**	**Introduction of Wireless Communication**
History and evolution of mobile radio systems. Types of mobile wireless services/systems-Cellular, WLL, Paging, Satellite systems, Future trends in personal wireless systems.		
Unit – 2	**Number of lectures = 10**	**Cellular Concepts and System Design Fundamentals**
Cellular concept and frequency reuse, channel assignment, handoff strategies, Interference and system capacity, Trunking and GOS, cell splitting, cell sectoring.		
Unit – 3	**Number of lectures = 8**	**Mobile radio Propagation Models**
Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and Base band impulse respond models, parameters of mobile multipath channels, Antenna systems in mobile radio.		
Unit – 4	**Number of lectures = 12**	**Modulation, Equalization & Diversity Techniques**

Overview analog and digital modulation techniques, GMSK,QAM,OFDM, Spread spectrum modulation, Equalization, Rake receiver concepts, Diversity Techniques, Linear predictive coders and channel coding; M**multiple Access Techniques, Wireless Systems & Standards:** FDMA, TDMA and CDMA systems, Introduction to 2G,3G Wireless systems and standards.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

13. Books Recommended

1. Theodore S. Rappaport, "wireless communications Principles and Practices", PHI, 2005
2. Jochen Schiller, "Mobile Communications", Pearson Education, second edition, 2009.

Reference Book

1. Lee W.C.Y, "Mobile communication Engineering
2. Theory and Applications", 2/e McGraw-Hill, New York, 2003
3. Andreas F. Molisch, "Wideband Wireless Digital Communication", Pearson Education 2001.

1. Name of the Department – ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**Computational Electromagnetics**	**L –** 3	**T – 0**		**P -0**	
3.Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Electromagnetic Field Theory**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 39		**Tutorials =**	**Practical =**			

8. Brief Syllabus

Subject deals with study of Numerical analysis of Electromagnetic Theory for Cartesian, Cylindrical and Spherical System distributed in Units I, II and III. Unit IV provides study of Microwave Perturbation and Variation Techniques.

9. Learning objectives:

1. To explain the plane waves functions and analyze the various rectangular shaped microwave components and their properties for different modes in rectangular coordinate system.
2. To develop an ability to analyze the cylinder wave functions and various cylindrical shaped microwave components and their properties for different modes in cylindrical coordinate systems.
3. To develop and ability to evaluate different parameters of microwave components using perturbation and variation techniques.

10. Course Outcomes (COs):

On completion of this course, the students will be able to

1. Demonstrate understanding on the plane waves functions and calculation of various performance parameters of different kinds of rectangular microwave components such as; rectangular waveguide, rectangular cavity, partially filled waveguide and dielectric slab waveguide apart from the concepts of surface guided waves and modal expansion of fields
2. Have an ability to analyze the cylindrical wave functions and calculation of various performance parameters of different kinds of cylindrical microwave components such as; circular waveguide, circular cavity and parallel plate, partially filled, dielectric slab coated and corrugated radial waveguides apart from the concepts of sources of cylindrical waves, two dimensional radiation and wave transformations.
3. Demonstrate insight to use the perturbation and variation techniques to evaluate the different parameters due to perturbations on cavity walls, cavity materials and waveguide apart from the knowledge of stationary formulas for cavity.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Plane Wave Functions I & II**

The Wave Functions, Plane Waves, Rectangular Waveguide, Alternative Mode Sets, The Rectangular Cavity. Partially Filled Waveguide, Dielectric Slab Waveguide, Surface Guided Waves, Modal Expansion of Fields.

Unit – 2	**Number of lectures = 10**	**Cylindrical Wave Functions I & II**

The Wave Functions, Circular Waveguide, Radial Waveguides, Circular Cavity, Other Guided Waves. Cylindrical Wave Functions II: Sources of Cylindrical Waves, Two Dimensional Radiation, Wave Transformations, Scattering by Cylinders.

Unit – 3	**Number of lectures = 10**	**Spherical Wave Functions I & II**

The Wave Functions, Spherical Cavity, Orthogonality Relationships, Space as a Waveguide. Spherical Wave Functions II: Other Radial Waveguides, Other Resonators, Sources of Spherical Waves, Wave

Transformations, Scattering by Spheres.		
Unit – 4	**Number of lectures =9**	**Perturbational and Variational Techniques**
Perturbation of Cavity Walls, Cavity Material Perturbations, Waveguide Perturbations, Stationary Formulas for Cavities.		
12. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/ Journal papers; Patents in the respective field.		
13. Books Recommended		
1. Time Harmonic Electromagnetic Fields; By Roger F. Harrington; McGraw Hill Book Company; 1961.		

1. Name of the Department – ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**Digital Image Processing with Simulation**	**L -** 3	**T – 1**		**P -0**	
3. Course Code						
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Signal Processing**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 36		**Tutorials =**	**Practical =**			

8. Brief Syllabus

Digital image processing is a fascinating subject in several aspects. Human beings perceive most of the information about their environment through their visual sense. While for a long time images could only be captured by photography, we are now at the edge of another technological revolution which allows image data to be captured, manipulated, and evaluated electronically with computers. With breathtaking pace, computers are becoming more powerful and at the same time less expensive, so that widespread applications for digital image processing emerge.

9. Learning objectives:

1. To impart the basic concepts of image segmentation and shaping
2. To apply different types signal processing techniques in image processing

10. Course Outcomes (COs):

On completion of this course, the students will be able to

1. Know Basics of Image formation and transformation using sampling and quantization
2. Define different types of signal processing techniques used for image sharpening and smoothing
3. Perform and demonstrate the compression and coding techniques used for image data

11. Unit wise detailed content

Unit-1	**Number of lectures = 8**	**Introduction to Image Processing**
Image formation, image geometry perspective and other transformation, sterio imaging elements of visual perception. Digital Image-sampling and quantization serial & parallel Image processing.		
Unit – 2	**Number of lectures = 10**	**Signal Processing**
Signal Processing - Fourier, Walsh-Hadmard discrete cosine and Hotelling transforms and their properties, filters, correlators and convolvers. Image enhancement-Contrast modification. Histogram specification, smoothing, sharpening, frequency domain enhancement, pseudo-colour Enhancement.		
Unit – 3	**Number of lectures = 10**	**Image Restoration**
Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.		
Unit – 4	**Number of lectures =8**	**Segmentation Techniques**
Image Segmentation: fundmentals, point, line and edge detection, region based segmentation		

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended (3 Text Books + 2-3 Reference Books)

1. Ganzalez and Wood, “Digital Image Processing”, Addison Wesley, 1993
2. Anil K. Jain, “Fundamental of Image Processing”, Prentice Hall of India

Reference Books

1. Rosenfeld and Kak, “Digital Picture Processing” vol. I & vol. II, Academic, 1982
2. Ballard and Brown, “Computer Vision”, Prentice Hall, 1982.
3. Wayne Niblack, “An Introduction to Digital Image Processing”, Prentice Hall, 1986

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**IoT Architecture and Protocols**	**L**	**T**		**P**	
3. Course Code		3	0		2	
4. Type of Course (use tick mark)		✓ **Core ()**	**PE()**		**OE()**	
5. Pre-requisite (if any)	NIL	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 48		**Tutorials = 00**	**Practical =**			

8. Brief Syllabus

An overview of protocols involved in Internet of Things devices and applications. Help clarify with IoT layer technology stack and head-to-head comparisons. The Internet of Things covers a huge range of industries and use cases that scale from a single constrained device up to massive cross-platform deployments of embedded technologies and cloud systems connecting in real-time. At the same time, dozens of alliances and coalitions are forming in hopes of unifying the fractured and organic IoT landscape.

9. Learning objectives: The objective of this course is to impart knowledge on IoT Architecture and various protocols, study their implementations

10. Course Outcomes: On completion of this course, the students will be able to

1. Understand the Architectural Overview of IoT
2. Understand the IoT Reference Architecture and Real World Design Constraints.
3. Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Overview**

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

Unit - 2	**Number of lectures = 12**	**Reference Architecture**

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference ArchitectureIntroduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Unit - 3	**Number of lectures = 12**	**IOT Data Link Layer & Network Layer Protocols**

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

Unit - 4	**Number of lectures = 12**	**Transport & Session Layer Protocols**

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT UNIT V – SERVICE LAYER PROTOCOLS & SECURITY (12 hours) Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer .

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications
5. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1 st Edition, VPT, 2014.

1. Name of the Department-ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	**RF Circuit Design**	**L**	**T**		**P**	
3. Course Code		3	0		0	
4. Type of Course (use tick mark)		✓ **Core ()**	**PE()**		**OE()**	
5. Pre-requisite (if any)	**Microwave Engineering, Circuit Theory**	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 39		**Tutorials = 00**	**Practical =**			

Brief Syllabus:

Introduction to RF Design and Wireless Technology: Design and Applications, Complexity and Choice of Technology. Basic concepts in RF design: Nonlinearly and Time Variance, Inter symbol interference, random processes and noise. Sensitivity and dynamic range, conversion of gains and distortion RF Modulation: Analog and digital modulation of RF circuits, Comparison of various techniques for power efficiency, Coherent and non-coherent detection, Mobile RF communication and basics of Multiple Access techniques. Receiver and Transmitter architectures, Direct conversion and two-step transmitters RF Testing: RF testing for heterodyne, Homodyne, Image reject, Direct IF and sub sampled receivers.

8. Learning objectives:

1. To explain radio frequency design concept and impart knowledge on design and implementation of high frequency transceiver system.
2. To develop an ability to analyze various components of radio frequency communication system architecture.
3. To develop an ability to analyze different design parameters of transceiver circuit design, besides developing an insight to make use of several high frequency design techniques.
4. To utilize the various RF circuit design concepts in designing the RF transceiver systems.
5. To review and refer the literature related to RF Circuit design and reporting it ethically.

9. Course Outcomes:

The students will be able to

1. Demonstrate understanding on the Radio frequency design concept and impart knowledge on design and implementation of high frequency Transceiver system.
2. Have an ability to analyze various components of Radio frequency communication system architecture.
3. Have an ability to analyze the impact of different design parameters in transceiver circuit design, besides developing an insight to make use of several high frequency design techniques.
4. Have an ability to utilize the various RF circuit design concepts in designing the RF transceiver systems.
5. Have an ability to review and refer the literature related to RF circuit design and report it ethically.

10. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Introduction, An Overview of RF Filter Design I**

Introduction: Importance of RF Design, RF Behavior of Passive Components: High Frequency Resistors, High-Frequency Capacitors, High-Frequency Inductors. Chip Components and Circuit Board Considerations: Chip Resistors, Chip Capacitors, Surface-Mounted Inductors. An Overview of RF Filter Design I: Basic Resonator and Filter Configurations: Filter Type and Parameters, Low-Pass Filter, High Pass Filter, Bandpass and Bandstop Filters, Insertion Loss, Special Filter Realizations: Butterworth –Type, Chebyshev and Denormalization of Standard Low-Pass Design.

Unit - 2	**Number of lectures = 10**	**An Overview of RF Filter Design II**

Filter Implementations: Unit Elements, Kuroda's Identities and Examples of Microstrip Filter Design. Coupled Filter: Odd and Even Mode Excitation, Bandpass Filter Section, Cascading Bandpass Filter Elements, and Design Examples.

Unit - 3	**Number of lectures = 10**	**Matching and Biasing Network**

Impedance Matching using Discrete Components: Two Component Matching Networks, Forbidden regions, Frequency Response and Quality Factor, Microstrip Line Matching Networks: From Discrete Components to Microstrip Lines, Single-Stub Matching Networks, Double-Stub Matching Networks, Amplifier Classes of Operation and Biasing Network: Classes of Operation and Efficiency of Amplifiers, Bipolar Transistor Biasing Networks, Field Effect Transistor Biasing Networks.

Unit - 4	**Number of lectures = 9**	**RF Transistor Amplifier Design**

Characteristics of Amplifiers, Amplifier Power Relations: RF source, Transducer Power Gain, Additional Power Relations, Stability Considerations: Satbility Circles, Unconditional Stability, Stabilization Methods.

11. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

12. Books Recommended

1. B. Razavi, "RF Microelectronics" PHI 1998 2. R. Jacob Baker, H.W. Li, D.E. Boyce "CMOS Circuit Design, layout and Simulation",
2. Thomas H. Lee "Design of CMOS RF Integrated Circuits" Cambridge University press 1998.
3. Y.P. Tsividis, "Mixed Analog and Digital Devices and Technology", TMH 1996
4. RF Circuit Design Theory and Application, Reinhold Ludwig and Pavel Bretchko, Ed. 2004, Pearson Education.

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING							
2. Subject Name	**Professional Ethics for Electronics**	**L**	**T**		**P**		
3. Subject Code		3	0		0		
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**		
5. Pre-requisite (if any)	NIL	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()	
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures = 42		**Tutorials = 0**	**Practical =**				

8. Brief Syllabus

Intensive study of moral issues and conflicts that arise when one attempts to reconcile the priorities of professional responsibilities and the world of business with those of an ethical frame of mind. Emphasis on issues surrounding the concepts of duty, rights, autonomy, justice, and regulation of business, together with extended reflections on the relationship between moral responsibility and the professions (drawing from specific fields such as engineering, medicine, and law)

9. Learning objectives:

1. To create awareness on professional ethics for engineers
2. To respect the rights of others and develop a global perspective

10. Course Outcomes (COs):

At the end of this course students will demonstrate the ability to

1. 1. Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
2. Identify the multiple ethical interests at stake in a real-world situation or practice
3. Articulate what makes a particular course of action ethically defensible
4. Assess their own ethical values and the social context of problems

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**

Understanding Professional Ethics and Human Values Current scenario – contradictions – dilemmas – need for value education and self esteem – Human values – morals – values – integrity – civic virtues - work ethics – respect for others – living peacefully – caring – honesty – courage – valuing time – co operation – commitment – empathy – self confidence - character

Unit – 2	**Number of lectures =12**

Ethics for Engineers Ethics – its importance – code of ethics – person and virtues – habits and morals – 4 main virtues – ethical theories – Kohlberg's theory – Gilligan's theory – towards a comprehensive approach to moral behavior – truth – approach to knowledge in technology

Unit – 3	**Number of lectures = 12**

Environmental Ethics and sustainability problems of environmental ethics in engineering - engineering as people serving profession – engineer's responsibility to environment – principles of sustainability - industrial, economic, environmental, agricultural and urban sustainability - Sustainable development.

Unit – 4	Number of lectures = 12	
Social Experimentation, Responsibility and Rights Engineers as responsible experiments – safety and risk – confidentiality – knowledge gained confidentiality – experimental nature of engineering – Intellectual Property Rights – professional rights – employee rights – occupational crime		

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.

13. Books Recommended (3 Text Books + 2-3 Reference Books)

1 Mike W Martin, Roland Schinzinger, "Ethics in Engineering", Tata McGraw -Hill, 2003

Reference Books

1. Govindarajan M, Natarajan S, Senthil Kumar V S, "Engineering Ethics" PHI India, 2004
2. P Aarne Vesblind, Alastair S Gunn, "Engineering Ethics and the Enviornment"
3. Edmund G Seebauer, Robert L Barry, "Fundamentals of Ethics for scientists and engineers" Oxford University Press 2001

<table>
<tr><td colspan="8">1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING</td></tr>
<tr><td>2. Course Name</td><td colspan="2">Review Article phase I</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td>3. Course Code</td><td colspan="2"></td><td colspan="2">0</td><td colspan="2">0</td><td>6</td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td colspan="2">Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE()</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td>Practical knowledge of all labs</td><td colspan="2">6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 42</td><td colspan="3">Tutorials = 0</td><td colspan="2">Practical =</td></tr>
<tr><td colspan="8">8. Brief Syllabus
This course deals with the different type of sensors, transducers and their interfacing with microcontrollers. This also describes their role to know the domain status. It also deals with the process to further processing of sensing elements.</td></tr>
<tr><td colspan="8">9. Learning objectives:
1. To gain first-hand experience of publication.
2. To experience the discipline in the term of research presentation through journals conferences.
3. To know the right publication to present your work in globally acceptable organization.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):
On completion of this course, the students will be able to select the right publication for present & how to select the correct domain to work.</td></tr>
<tr><td colspan="8">11.Course Content
1. Select the domain to apply your whole knowledge & skills to improve engineering
2. Choose correct field to work further.
3. Select the few papers & review them either on same software or through different emulator/simulator.
4. Summarize the work and present in national/international conference at least.</td></tr>
<tr><td colspan="8">12.Brief Description of self learning / E-learning component
The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.
The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/
Journal papers; Patents in the respective field.</td></tr>
<tr><td colspan="8">13.Books Recommended (3 Text Books + 2-3 Reference Books)</td></tr>
<tr><td colspan="8"></td></tr>
</table>

1. Name of the Department : Electronics and Communication Engineering						
2. Subject Name	**Wireless Lab**	**L**	**T**		**P**	
3. Subject Code		0	0		2	
4. Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5. Pre-requisite (if any)	-	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 10**			

8. Brief Syllabus

The course addresses the fundamentals of wireless communications and provides an overview of existing and emerging wireless communications networks. It covers radio propagation and fading models, fundamentals of cellular communications, multiple access technologies, and various wireless networks, including past and future generation networks. Simulation of wireless systems under different channel environments will be integral part of this course.

9. **Course Objectives**

1. To provide an overview of Wireless Communication networks area and its applications in communication engineering.
2. To appreciate the contribution of Wireless Communication networks to overall technological growth.
3. To understand the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.

10. Course Outcomes

1. To understand the basics of Wireless Communication Networks.
2. To motivate the students to pursue research in the area of wireless communication.

11. List of Experiments

1. To set up a satellite communication link & study of change in uplink & downlink frequency.
2. To Study Transmission of Audio & Video Signals & Data communication over satellite link.
3. To Study Transmission of telemetry data like temperature & light intensity over satellite link
4. To measure the propagation delays of signal in a Satellite communication Link.
5. To study different GPS data like longitude, latitude & different types of dilute of precision using GPS receiver.
6. To study selection of various PN codes like Gold, Barker & MLS in CDMA technology.
7. To study generation (spreading) & demodulation (Despreading) of DSSS modulated signal
8. To study Voice communication over DSSS.
9. To study Minimum shift keying modulation & de modulation.
10. To study radiation pattern & calculate beam width for Yagi uda & Folded dipole antenna.
11. To study radiation pattern & calculate beam width for Circular & Triangular Patch Antenna.
12. To study FHSS Modulation & demodulation & transfer of numeric data.

12. **Brief Description of self learning / E-learning component**

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.
https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended (3 Text Books + 2-3 Reference Books)

1.Haesik Kim, “Wireless Communications System Design”, John Wiley & Sons, 2015
2. Andreas F Molisch , “Wireless Communications”, John Wiley & Sons, 2012.
3. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2007.

1. Name of the Department : Electronics and Communication Engineering						
2.Subject Name	**Industrial Training -III**	**L**	**T**		**P**	
3.Subject Code		0	0		0	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	**Courses up to 6th sem**	**15. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical = 10**			

7.Brief Syllabus

The Industrial Training indicates to a program which aims to provide a managed good practical training within a particular time frame. The main objectives of the industrial training are to provide the best and relevant theoretical knowledge to gain in a particular time period.

8.Course Objectives

4. To gain first-hand experience of working as an engineering professional, including the technical application of engineering knowledge.
5. To experience the discipline of working in a professional organization and multidisciplinary team.
6. To develop technical, interpersonal and communication skills.

9.Course Outcomes

On completion of this course, the students will be able to get the structure of industry. He will know the various departments of industry & how industry works.

10. Course Content

1. After 6th semester & before 7th semester.
2. Duration for training should be 2 Months.
3. It must be in Industry for study the working process & determine problems & propose solution.
4. Students have to submit to one spiral binding report & PPT presentation in internal examination.
5. Students have to submit three Hard binding report & PPT presentation in final end term examination

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/

12.Books Recommended (3 Text Books + 2-3 Reference Books

1. Name of the Department : Electronics and Communication Engineering						
2.Subject Name	**GL IV Lab**	**L**	**T**		**P**	
3.Subject Code		0	0		0	
4.Type of Course (use tick mark)		**Core (√)**	**PE()**		**OE()**	
5.Pre-requisite (if any)	**Courses up to 4th Sem**	**16. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()
6.Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 00		**Tutorials = 00**	**Practical =00**			

7.Brief Syllabus

A course covers the Computational Electromagnetic, DIP with simulation, IoT Architecture and RF VLSI.

8.Course Objectives The student will learn and understand

1. Basics of Display of Gray scale Images.
2. Needs and significance of Histogram Equalization.
3. To testing the programming skills.

9.Course Outcomes

The students will be able to

1. Design the schematic for the different logic gates using NMOS technology.
2. Design the different adder circuits using NMOs technology.
3. Design the schematic for the different logic gates using CMOS technology.

10. Section A: Computational Electromagnetic

List of Experiments:

1. To verify Faraday's law of induction.
2. To obtain the magnetic field due to current in a straight conductor as a function of the current and as a function of the normal distance from the conductor.
3. To verify the relationship between the voltage, the electric field and the spacing of a parallel plate capacitor.
4. To demonstrate the phenomena of reflection and transmission of electromagnetic fields.

Section B: DIP with simulation

List of Experiments:

4. Display of Gray scale Images.
5. Histogram Equalization
6. Design of Non-linear Filtering
7. Determination of Edge detection using Operators
8. 2-D DFT and DCT
9. Filtering in frequency domain.
10. Display of colour images
11. Conversion between colour spaces.
12. DWT of images.
13. Segmentation using watershed transform.

Section C: IoT Architecture

List of Experiments:

1. **Section**Designing a non standard communication interface for an IoT system
2. H/w - S/w co design: Clock budgeting and power saving
3. PDR with shoe-mounted inertial sensors
4. Positioning and motion sensing using ultra low cost motion sensor

D: RF VLSI

List of Experiments:

4. Design the schematic for the different logic gates using NMOS technology.
5. Design the different adder circuits using NMOs technology.
6. Design the schematic for the different logic gates using CMOS technology.
7. Design the different adder circuits using CMOS technology.
8. Do the Transient, AC & DC analysis for the NMOS & CMOS Logic Gates.

11.Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/

12.Books Recommended (3 Text Books + 2-3 Reference Books)

SGT UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CURRICULUM- 2019-2020
B. Tech. – VIII Semester

Sr. No.	Subject Code	Course title	Schedule				Mark		
			L	T	P	C	Int.	Ext.	Total
1		Program Elective-V	3	0	0	3	40	60	100
2		Program Elective-VI	3	0	0	3	40	60	100
3		Review Article phase-II	0	0	6	3	40	60	100
4		General Lab-V	0	0	2	1	40	60	100
5		General Lab-VI	0	0	2	1	40	60	100
Total Contact Hours			**6**	**0**	**10**	**11**	**200**	**300**	500
			16						

Program Elective-V	
	Microwave in MIC's
	Optical Communication
	Arduino Programming & Introduction to Raspberry Pi
	Verilog Programming

Program Elective-VI	
	Satellite communication
	RF component Design: Simulator Approved
	Modern Comm. Technologies
	High Speed Electronics

1. Name of the Department: Electronics and Communication Engineering						
2. Subject Name	Microwave in MIC's	**L**	**T**		**P**	
3. Course Code		**3**	**1**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 14**	**Practical = 0**			

8. Brief Syllabus

Optical fibre systems include long distance backbone or trunk networks, metropolitan and access networks, passive optical networks and radio on fibre or fibre wireless systems. Fibre networks are also used to distribute signals for broadband wireless access networks.

The design of an optical fibre system involves many design factors and trade-offs. The characteristics and limitations of system components (laser diodes, optical modulators, optical fibre, optical amplifiers and optical receivers) and the factors affecting the performance of different optical fibre communication systems will be studied.

9. Course Objectives:

1. To explain the monolithic microwave integrated circuits, its applications, advantages over discrete circuit and different fabrication techniques apart from encapsulation and mounting of active devices.
2. To develop an ability to analyze the microstrip transmission lines and slot lines.
3. To develop an ability to evaluate and analyze the various fin lines and coplanar waveguides apart from the various uses of lumped elements in microwave integrated circuits.
4. To develop an ability to evaluate the performance of microwave integrated circuits by using different measurements and testing techniques.

10. Course Outcomes:

1. Demonstrate understanding on the Monolithic Microwave Integrated Circuits their applications, advantages, various fabrication techniques such as thin and thick films technologies, encapsulation and mounting of active devices and performance of microstrip on semiconductor substrate.
2. Demonstrate insight to develop an ability to evaluate the performance of microwave integrated circuits by using different measurements and testing techniques.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Introduction**
Introduction to Monolithic Microwave Integrated Circuits (MMICs), their advantages over discrete circuits, MMIC fabrication techniques, Thick and Thin film technologies and materials, encapsulation and mounting of active devices. Microstrips on semiconductor substrates.		
Unit - 2	**Number of lectures = 12**	**Transmission Lines**
Planar transmission lines for MICs. Method of Conformal transformation for microstrip analysis, concept of effective dielectric constant, Effective dielectric constant for microstrip, Losses in Microstrip.		
Unit - 3	**Number of lectures = 8**	**Slot Line**
Slot Line Approximate analysis and field distribution, Transverse resonance method and evaluation of slot line impedance, comparison with microstrip line.		
Unit - 4	**Number of lectures = 8**	**Fin & Coplanar Lines & MIC Measurement**
Fin lines & Coplanar Lines. Introduction, Analysis of Fin lines by Transverse Resonance Method, Conductor loss in Fin lines. Introduction to coplanar wave guide and coplanar strips. MIC Measurement,		

Testing and Applications: MIC measurement system, measurement techniques – S parameter measurement, noise measurement, MIC applications.

12. Brief Description of self learning / E-learning component

13. Books Recommended (3 Text Books + 2-3 Reference Books)

Text Book:

1. Microwave Integrated circuit, K. C. Gupta.
2. Microwave Devices & Circuits 3/e, Samuel Y. Liao.
3. Microstrip lines and Slot lines, K.C. Gupta, R. Garg. , I. Bahl, P. Bhartia, Artech House, Boston, 1996.

Reference Books:

1. Stripline-like Transmission lines for Microwave Integrated circuits, B. Bhat, S. K. Koul, Wiley Eastern Ltd., New Delhi.
2. Microwave Integrated Circuits, By Ivan Kneppo, J. Fabian, P. Bezousek

1. Name of the Department: Electronics and Communication Engineering						
2. Subject Name	**Optical Communication**	**L**	**T**		**P**	
3. Course Code		**3**	**1**		**0**	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 14**	**Practical = 0**			

8. Brief Syllabus

9. Learning objectives:

By the completion of the course, you should be able to:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.

2. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.

3. To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM.

10. Course Outcomes:

On completion of this course you should be able to:

1. Explain the principles of operation of various optical fibre communication systems.

2. Calculate various key parameters of optical fibre systems. These include the system optical power budget and system rise time budget, receiver noise power, Q factor, bit error rate and maximum usable bit rate of a digital optical fibre system.

3. Communicate laboratory findings through written reports.

11. Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Overview of Optical Fiber Waveguides**

General system, transmission link, advantage of optical fiber communication. Basic structure of optical fiber waveguide, ray theory transmission, optical fiber modes and configuration, step index & graded index fiber, single mode fiber , fiber materials , fiber fabrication.

Unit - 2	**Number of lectures = 12**	**Signal Degradation of Optical Fiber**

Introduction, attenuation, intrinsic & extrinsic absorption losses, linear & nonlinear scattering losses, bending losses, distortion in optical wave guide, intramodal and intermodal dispersion. Power launching and coupling Source to fiber power launching, power calculation, lensing schemes, fiber to fiber joints, fiber splicing technique, fiber connectors.

Unit - 3	**Number of lectures = 8**	**Optical Sources and Receiver**

LASER: Basic concepts of laser, Optical emission from semiconductors, Semiconductor injection laser (ILD), Injection laser characteristics.LED: power and efficiency, LED structures, LED characteristics.
Optical detectors: p-n photodiodes, p-i-n photodiodes, Avalanche photodiodes, Quantum efficiency, speed of response, Phototransistor; **Optical receiver:** Receiver operation, digital receiver noise , shot noise , pre-amplifier types , Digital receiver performance, introduction to analog receivers.

Unit - 4	**Number of lectures = 8**	**Digital Transmission Systems**

Point to point links, system considerations, link power budget, rise time budget, modulation formats for analog communication system, introduction to WDM concepts, Introduction to advanced multiplexing strategies.

12. Brief Description of self learning / E-learning component

13. Books Recommended (3 Text Books + 2-3 Reference Books)

Text Books

1. 1.G.Keiser: Optical Fiber Communication – MGH
2. Jenkins & White : Fundamentals Of Optics – MGH

1. Name of the Department: Electronics and Communication Engineering							
2. Subject Name	**Arduino Programming and Introduction to raspberry pi**	**L**	**T**		**P**		
3. Course Code		**3**	**1**		**0**		
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**		
5 Pre-requisite (if any)		**6. Frequency**	Even ()	Odd (✓)	Either Sem()	EverySem ()	
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)							
Lectures = 42		**Tutorials = 14**	**Practical = 0**				

8. Course Description

With Arduino, one can get to know the basics of micro-controllers and sensors very quickly and can start building prototype with very little investment. This course is intended to make you comfortable in getting started with Arduino, Introduction to Raspberry Pi , Linux Shell programming, GPIO, C programming on Pi,using Python, IoT Design using Raspberry Pi.

9. Course Objectives

1. To provide practical know-how and hands-on experience, which is grossly missing from the engineering curriculum.
2. Learning how to use Arduino and Raspberry Pi means learning how hardware and software come together to create interesting and useful devices.

10. **Course Outcomes:** Upon the completion of this course, students will able to demonstrate the ability to

1. Create sketches, libraries inside the Arduino Development Environment.
2. Measure various physical parameters using sensors.
5. Implement various communication protocols for wired and wireless communication.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Introduction to Arduino**

The Arduino Platform, Block diagram, Architecture, Pin functions, overview of main features such as I/O Ports, Timers, interrupts serial port, PWM, ADC, etc. Introduction to Arduino IDE, writing, saving, compiling and uploading sketches.

Unit - 2	**Number of lectures = 8**	**Interfacing**

Interfacing discrete LEDs, Binary counter, Seven Segment LEDs. Interfacing LCD, switch Interface. Interfacing with different type of sensors and communication modules.

Unit - 3	**Number of lectures = 8**	**Introduction to Raspberry Pi**

Raspberry Pi – Introduction-Basics, applications, installation. Preparing SD Card for Raspberry Pi. different OS versions. First boot, Configuration, time setting, keyboard layout, disk expand, etc. Pre installed apps. Raspi-config. Connecting with Wi-Fi/ LAN. Basics of the Linux OS used on the **Pi.**

Introduction to shell/Programming on Linux: Basic shell command. Editor Vi, Nano, etc. Accessing the Man Pages. Piping Shell Commands. Performing APT Package updates. Remote SSH Access + VNC.

GPIO Shell Programming for blinking LED. Introduction To Wiring pi Library (C Programming) Using wiring Pi Library for GPIO Access

Unit - 4	**Number of lectures = 8**	**Introduction to Programming on Pi using Python**

Variables, Condition Statement. Loops, Importing Libraries. Functions, Classes. Python and Hardware Access· LED Blinking using Python Raspberry pi library. Temperature sensing using 1-wire temp sensor· Motion detection using Raspberry pi. Sending email alerts when Motion detected using PIR sensor· Configuring web server. Using own Cloud on Raspberry Pi

IoT Design using Raspberry Pi: Introduction to IoT. IoT Applications based on Pi. Installing and configuration IoT Framework. GPIO Control over Web Browser. Creating Custom Web Page for Lamp. Interfacing light emitting diodes (LEDs), switch, buzzer. Raspberry Pi sensor interfacing

12. Brief Description of self learning / E-learning component

13. Books Recommended (3 Text Books + 2-3 Reference Books)

Reference Books

1. Arduino Cookbook, 2nd Edition, by Michael Margolis.

2. Getting Started with Arduino: The Open Source Electronics Prototyping Platform (Make) 3rd Edi						
1. Name of the Department: Electronics and Communication Engineering						
2. Course Name	**Verilog Programming**	**L**	**T**		**P**	
3. Course Code		3	1		0	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5. Pre-requisite (if any)	**Digital Logic Design**	**6. Frequency (use tick marks)**	Even (Y)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 40		**Tutorials = 0**	**Practical = 12**			

8. Course Description

Course cover the VLSI design technology for the development of analog and digital design. Detailed applications of verilog design.

9. Course Objectives: The student will learn and understand

1. The evolution of VLSI technologies for the development of Integrated circuit.
2. The significance of VLSI design in the electronics application.
3. Design procedure of VLSI design using verilog.

10. Course Outcomes: The students will be able to

1. Develop VLSI IC's for the use of analog circuits in compact form.
2. Design the digital circuits using Verilog VLSI technologies.

11. Unit wise detailed content

Unit-1	**Number of lectures = 13**	**Overview of Digital Design with Verilog HDL**

Overview of Digital Design with Verilog HDL, Evolution of CAD, emergence of HDLs, typical HDL-flow, Hierarchical Modeling Concepts, Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block.

Unit - 2	**Number of lectures = 14**	**Basic Concepts**

Basic Concepts, Lexical conventions, data types, system tasks, compiler directives, Modules and Ports, Module definition, port declaration, connecting ports, hierarchical name referencing.

Unit - 3	**Number of lectures =12**	**Gate-Level Modeling**

Gate-Level Modeling, Modeling using basic Verilog gate primitives, description of AND/OR and BUF/NOT type gates, rise, fall and turn-off delays, min, max, and typical delays, Dataflow Modeling, Continuous assignments, delay specification, expressions, operators, operands, operator types.

Unit - 4	**Number of lectures = 8**	**Behavioral Modeling**

Behavioral Modeling, Structured procedures, initial and always, blocking and non-blocking statements, delay control, generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks.

12. Books Recommended (3 Text Books + 2-3 Reference Books)

1. A Verilog HDL Primer, J. Bhasker

2. Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition, Samir Palnitkar, Prentice Hall PTR

1. Name of the Department: Electronics and Communication Engineering						
2. Course Name	Satellite Communication	**L** **3**	**T** **0**		**P** **0**	
3. Course Code						
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5. Pre-requisite (if any)	**Digital Communication**	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 42		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

The courses cover the most relevant aspects of satellite communications, with emphasis on recent applications and developments. The course begins with a review on the history and basic concepts of satellite communications. Next it covers the orbital aspects, with emphasis on the geostationary orbit followed by a discussion of satellite subsystem and launching methods. The design of a digital satellite link is discussed in detail, including link budget, modulation, error control and multiple access methods. Frequency assignments and propagation aspects that affect the satellite link are then discussed. Antennas and earth station technology are presented, including the design of very small aperture terminals (VSATs).

9. Learning objectives:

1. This course describes orbital mechanism of satellites.
2. The multiplexing and multiple access techniques of Satellite communication are also discussed.
3. GPS and other applications of satellite communication are covered in this course.

10. Course Outcomes:

i) Discuss various multiplexing and multiple access techniques
ii) Design satellite uplink and downlink under various conditions
iii) Demonstrate the GPS concepts for ethical usage in society

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Principles Of Satellite Communication**

Evolution & growth of communication satellite, Synchronous satellite, Satellite frequency allocation & Band spectrum, Advantages of satellite communication, Active & Passive satellite, Modem & Codec. Applications of satellite communication.

COMMUNICATION SATELLITE LINK DESIGN: Introduction, General link design equations, System noise temperature, C/N & G/T ratio, Atmospheric & Ionospheric effects on link design, Complete link design, Earth station parameters.

Unit - 2	**Number of lectures = 8**	**Analog and Digital Satellite Communication**

Introduction, Baseband analog(Voice) signal, FDM techniques, S/N & C/N ratio in frequency modulation in satellite link, S/N ratio in FM with multiplexed telephone signal in satellite link, Single channel per carrier(SCPC) systems, Commanded single sideband (CSSB) systems, Analog FM/FDM TV satellite link, Inter modulation products & their effects in FM/FDM systems, Energy disposal in FM/FDM systems.

Digital Satellite Communication : Advantages of digital communication, Elements of digital satellite communication systems, Digital baseband signals, Digital modulation techniques like MSK,GMSK/, QAM ,Satellite digital link design, Time Division Multiplexing.

Unit - 3	**Number of lectures = 10**	**Multiple Access Techniques**

Introduction, TDMA, TDMA-Frame structure, TDMA-Burst structure, TDMA-Frame efficiency, TDMA-superframe, TDMAFrame acquisition & Synchronization, TDMA compared to FDMA, TDMA Burst Time Plan, Multiple Beam (Satellite switched) TDMA satellite system, Beam Hopping(Transponder Hopping) TDMA, CDMA & hybrid access techniques.

Satellite Orbits: Introduction, Synchronous orbit, Orbital parameters, Satellite location with respect to earth, Look angles, Earth coverage & slant range, Eclipse effect, Satellite placement in geostationary orbit, station keeping, Satellite stabilization.

Unit - 4	**Number of lectures = 12**	**Special Purpose Communication Satellite**

BDS, INMARSAT, INTELSAT, VSAT(data broadband satellite), MSAT(Mobile Satellite Communication technique), Sarsat (Search & Rescue satellite) & LEOs (Lower earth orbit satellite), Satellite communication with respect to Fiber Optic Communication, LANDSAT, Defense satellite.

Laser Satellite Communication: Introduction, Link analysis, Optical satellite link transmitter, Optical satellite link receiver, Satellite Beam Acquisition, Tracking & Positioning, Deep Space Optical Communication Link.

12. Brief Description of self learning / E-learning component

13. Books Recommended (3 Text Books + 2-3 Reference Books)

Text Books

1. Wilbur L. Pritchard, H.G. Suyderhoud, Robert A.Nelson, Satellite Communication Systems Engineering, Prentice Hall, New Jersey, 2006. ISBN-013-791468-7
2. Timothy Pratt and Charles W. Bostain, Satellite Communications, John Wiley and Sons, 2003. ISBN- 047137007X
3. D. Roddy, Satellite Communication, McGrawHill, 2006 ISBN- 0071486895

Reference Books

1. Tri T Ha, Digital Satellite Communication, McGrawHill, 1990. ISBN-978-0-07-007752-2
2. B. N. Agarwal, Design of Geosynchronous Spacecraft, Prentice Hall, 1993. ISBN- 0132001144

1 Name of the Department: Electronics and Communication Engineering						
2 Course Name	**RF Circuit Design**	**L** **3**	**T** **0**		**P** **0**	
3 Course Code						
4 Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5 Pre-requisite (if any)	**Microwave Engineering, Circuit Theory**	**6 Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7 Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8 Brief Syllabus

Radio frequency design concept and impart knowledge on design and implementation of high frequency transceiver system, to analyze various components of radio frequency communication system architecture, design parameters of transceiver circuit design, besides developing an insight to make use of several high frequency design techniques.

9 Course Objectives:

1. To explain radio frequency design concept and impart knowledge on design and implementation of high frequency transceiver system.
2. To develop an ability to analyze various components of radio frequency communication system architecture.
3. To develop an ability to analyze different design parameters of transceiver circuit design, besides developing an insight to make use of several high frequency design techniques.
4. To utilize the various RF circuit design concepts in designing the RF transceiver systems.
5. To review and refer the literature related to RF Circuit design and reporting it ethically

10 Course Outcomes:

1. Demonstrate understanding on the Radio frequency design concept and impart knowledge on design and implementation of high frequency Transceiver system.
2. Have an ability to analyze various components of Radio frequency communication system architecture.
4. Have an ability to utilize the various RF circuit design concepts in designing the RF transceiver systems.
5. Have an ability to review and refer the literature related to RF circuit design and report it ethically.

iv)

11 Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Introduction, An Overview of RF Filter Design I**

Introduction: Importance of RF Design, RF Behavior of Passive Components: High Frequency Resistors, High-Frequency Capacitors, High-Frequency Inductors. Chip Components and Circuit Board Considerations: Chip Resistors, Chip Capacitors, Surface-Mounted Inductors. An Overview of RF Filter Design I: Basic Resonator and Filter Configurations: Filter Type and Parameters, Low-Pass Filter, High Pass Filter, Band-pass and Band-stop Filters, Insertion Loss, Special Filter Realizations: Butterworth –Type, Chebyshev and De-normalization of Standard Low-Pass Design.

Unit - 2	**Number of lectures = 10**	**An Overview of RF Filter Design II**

Filter Implementations: Unit Elements, Kuroda's Identities and Examples of Microstrip Filter Design. Coupled Filter: Odd and Even Mode Excitation, Bandpass Filter Section, Cascading Bandpass Filter Elements, Design Examples.

Unit - 3	**Number of**	**Matching and Biasing Network**

	lectures = 7	
Impedance Matching using Discrete Components: Two Component Matching Networks, Forbidden regions, Frequency Response and Quality Factor, Microstrip Line Matching Networks: From Discrete Components to Microstrip Lines, Single-Stub Matching Networks, Double-Stub Matching Networks, Amplifier Classes of Operation and Biasing Network: Classes of Operation and Efficiency of Amplifiers, Bipolar Transistor Biasing Networks, Field Effect Transistor Biasing Networks.		
Unit - 4	**Number of lectures = 9**	**RF Transistor Amplifier Design**
Characteristics of Amplifiers, Amplifier Power Relations: RF source, Transducer Power Gain, Additional Power Relations, Stability Considerations: Satbility Circles, Unconditional Stability, Stabilization Methods.		
12 Brief Description of self learning / E-learning component		
13 Books Recommended (3 Text Books + 2-3 Reference Books)		
Text Book: 1. RF Circuit Design Theory and Application, Reinhold Ludwig and Pavel Bretchko, Ed. 2004, Pearson Education		

1 Name of the Department: Electronics and Communication Engineering						
2 Course Name	**Modern Digital Communication Techniques**	**L** **3**	**T** **0**		**P** **0**	
3 Course Code						
4 Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5 Pre-requisite (if any)	**Digital Communication**	**6 Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7 Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 46		**Tutorials = 0**	**Practical = 0**			

8 Course Description

This course describe the digital modulation techniques used in the major wireless and wire line communication systems in use today and for those being planned for the near future. We will discuss the space, time and frequency diversity techniques used in new wireless systems including the BLAST and MIMO techniques, and their combination with OFDM.

9 Course Objectives

1. To analyze the feasibility and cost–effectiveness of using modern media of communication for teaching:
2. To analyze the response to teachers and students about the introduction of modern media in higher education, and
3. To explore the modalities of bridging communication gap in education and developing innovative mid through modern media.

10 Course Outcomes

On completion of this course you should be able to:

1. Apply advanced data communicating methods and networking protocols for wireless and mobile environments
2. Creatively analyze mobile and wireless networks
3. Critically analyse security issues of mobile and wireless computing systems

11 Unit wise detailed content

Unit-1	**Number of lectures = 12**	**Coherent and Non-Coherent Communication**

Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Non coherent receivers in random phase channels; M-FSK receivers – Rayleigh and Rician channels – Partially coherent receives – DPSK; M-PSK; M-DPSK,-BER Performance Analysis.

Unit - 2	**Number of lectures = 10**	**Band limited Channels and Digital Modulations**

Eye pattern; demodulation in the presence of ISI and AWGN; Equalization techniques – IQ modulations; QPSK; QAM; QBOM; -BER Performance Analysis. – Continuous phase modulation; CPFM; CPFSK; MSK, OFDM.

Unit - 3	**Number of lectures = 12**	**Block Coded Digital Communication**

Architecture and performance – Binary block codes; Orthogonal; Biorthogonal; Transorthogonal – Shannon's channel coding theorem; Channel capacity; Matched filter; Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators – Linear block codes; Hamming; Golay; Cyclic; BCH ; Reed – Solomon codes

Unit - 4	**Number of lectures = 12**	**Convolutional Coded Digital Communication**

Representation of codes using Polynomial, State diagram, Tree diagram, and Trellis diagram – Decoding techniques using Maximum likelihood, Viterbi algorithm, Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm, Turbo Coding.

12	**Brief Description of self learning / E-learning component**
13	**Books Recommended (3 Text Books + 2-3 Reference Books)**

Text Books

1. John Proakis, "Digital Communications" 4th edition, Mc.Graw.Hill -2007

2. M.K.Simon, S.M.Hinedi and W.C.Lindsey, Digital communication techniques; Signaling and detection, Prentice Hall India, New Delhi. 1995.

Reference Books

1. Simon Haykin, Digital communications, John Wiley and sons, 1998.
2. Wayne Tomasi, Advanced electronic communication systems, 4th Edition Pearson Education Asia, 1998.
3. B.P.Lathi, Modern digital and analog communication systems, 3rd Edition, Oxford University press 1998.

1 Name of the Department: Electronics and Communication Engineering						
2 Course Name	**High Speed Electronics**	**L** **3**	**T** **0**		**P** **0**	
3 Course Code						
4 Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5 Pre-requisite (if any)		**6 Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7 Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 44		**Tutorials = 0**	**Practical = 0**			

8 Course Description

This course describe the high speed electronics techniques used in the major electronics, wireless and wire line communication systems in use today and for those being planned for the near future.

9 Course Objectives

1. Develop the skills to gain a basic understanding of high-speed electronics circuits.
2. Introduce students to properties of various components used in high speed electronics

10 Course Outcomes : At the end of the course, students will demonstrate the ability to:

1. Understand significance and the areas of application of high-speed electronics circuits.
2. Understand the properties of various components used in high speed electronics
3. Design High-speed electronic system using appropriate components.

11 Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Introduction**

Transmission line theory (basics) crosstalk and non ideal effects; signal integrity: impact of packages, vias, traces, connectors; non-ideal return current paths, high frequency power delivery, methodologies for design of high speed buses; radiated emissions and minimizing system noise; Noise Analysis: Sources, Noise Figure, Gain compression, Harmonic distortion, Intermodulation, Cross-modulation, Dynamic range

Unit - 2	**Number of lectures = 10**	**Devices**

Devices: Passive and active, Lumped passive devices (models), Active (models, low vs high frequency)

Unit - 3	**Number of lectures = 12**	**RF Amplifier Design**

RF Amplifier Design: Stability, Low Noise Amplifiers, Broadband Amplifiers (and Distributed) Power Amplifiers, Class A, B, AB and C, D E Integrated circuit realizations, Cross-over distortion Efficiency RF power output stages Mixers –Up conversion Down conversion, Conversion gain and spurious response. Oscillators Principles.PLL Transceiver architectures

Unit - 4	**Number of lectures = 12**	**Printed Circuit Board**

Printed Circuit Board: Anatomy, CAD tools for PCB design, Standard fabrication, Microvia Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design challenges.

12 Brief Description of self learning / E-learning component

13 Books Recommended (3 Text Books + 2-3 Reference Books)

Text Books

1. Stephen H. Hall, Garrett W. Hall, James A. McCall "High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices", August 2000, Wiley-IEEE Press
2. Behzad Razavi, "RF Microelectronics", Prentice-Hall 1998, ISBN 0-13-887571-5.
3. Guillermo Gonzalez, "Microwave Transistor Amplifiers", 2nd Edition, Prentice Hall

1 Name of the Department: Electronics and Communication Engineering						
2 Course Name	**D.T. Signal Processing**	**L-3**	**T-0**		**P-0**	
3 Course Code						
4 Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5 Pre-requisite (if any)	**Signal & Systems**	**6 Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7 Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 44		**Tutorials = 0**	**Practical = 0**			

8 Course Description

The goal of discrete time signal processing course is to provide a comprehensive coverage of signal processing methods and tools, including leading algorithms for various applications. The course objectives include an introduction to the theory of statistical signal processing methods and application development as related to signal processing, optimal linear filter theory, recursive methods for optimal filters, classical and modern spectrum analysis, and adaptive filtering.

9 Course Objectives

1. To introduce various techniques of digital signal processing that are fundamental to various industrial applications.
2. To know third generation DSP architectures and interfacing of memory and I/O peripherals to the DSP processors.

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

1 Apply DFT for the analysis of digital signals and systems.
2 Apply adaptive filters appropriately in communication systems

11 Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Discrete Fourier Transform**

Smmary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) deriving DFT from DTFT, properties of DFT periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences overlap save and overlap add method. Fast computation of DFT Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), DIF-FFT, Linear filtering using FFT.

Unit - 2	**Number of lectures = 10**	**Infinite Impulse Response Filters**

Characteristics of practical frequency selective filters, Characteristics of commonly used analog filters Butterworth filters, Chebyshev filters, Design of IIR filters from analog filters) Approximation of derivatives, Impulse invariance method, Bilinear transformation, Frequency transformation in the analog domain, Structure of IIR filter direct form I, direct form II, Cascade, parallel realizations.

Unit - 3	**Number of lectures = 12**	**Finite Impulse Response Filters**

Design of FIR filters, symmetric and Anti-symmetric FIR filters, design of linear phase FIR filters using Fourier series method, FIR filter design using windows (Rectangular, Hamming and Hanning window),Frequency sampling method, FIR filter structures, linear phase structure, direct form realizations.

Unit - 4	**Number of lectures = 12**	**Finite Word Length Effects**

Fixed point and floating point number representation, ADC, quantization, truncation and rounding, quantization noise, input / output quantization, coefficient quantization error, product quantization error, overflow error, limit cycle oscillations due to product quantization and summation, scaling to prevent overflow.

12 Brief Description of self learning / E-learning component

13 Books Recommended

TEXT BOOK

1. John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES

1. Emmanuel C. Ifeachor & Barrie. W. Jervis, “Digital Signal Processing”, Second Edition, Pearson Education / Prentice Hall, 2002.

2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, “Discrete-Time Signal Processing”, 8th Indian Reprint, Pearson, 2004.

3. Andreas Antoniou, “Digital Signal Processing”, Tata Mc Graw Hill, 2006.

1 . Name of the Department: Electronics and Communication Engineering						
2. Course Name	**Review Article phase-II**	**L-0**	**T-0**		**P-6**	
3. Course Code						
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5. Pre-requisite (if any)	**Industrial Exposure & Project Work**	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 44		**Tutorials = 0**	**Practical = 0**			

8 Course Description

The students are required to undergo In Research Project work of duration not less than 4 months in a reputed organization or concerned institute. The student who wishes to undergo Industrial project, the industry chosen for should be a private limited company.

9 Course Objectives

The objectives of the Research Article phase -II include:

1. To give students the opportunity to apply the knowledge and skills they have acquired on campus in a real-life work situation.
2. To provide students with opportunities for practical, hands-on learning from practitioners in the students' areas of specialization.
3. To expose students to a work environment, common practices, employment opportunities and work ethics in their relevant field.
4. To enhance the employability skills of the students.
5. To provide opportunities for students to be offered jobs in the organizations in which they undergo their Industrial Training.

10 Course Outcomes: The learning outcomes can be as follows:

1. Apply theoretical knowledge in industrial applications.
2. Acquire skills in communication, management and team work.
3. Practice ethical and professional work culture.
4. Implement Health and Safety practices in work place.

11 Course contents:

1. The students are required to undergo In Research Project work of duration not less than 4 months in a reputed organization or concerned institute.
2. The student who wishes to undergo Industrial project, the industry chosen for should be a private limited company.
3. The final Viva-voca of this will be conducted by the external examiner and one internal examiner appointed by the institute. External examiner will be from penal of examiner.
4. Assessment of this will be based on Seminar, viva-voca, report and certificate of completion by work.
5. The teacher engaged for this work shall have a workload of 6 hours per group.

1 Name of the Department: Electronics and Communication Engineering						
2 Course Name	**General Lab V**	**L-0**	**T-0**		**P-2**	
3 Course Code						
4 Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5 Pre-requisite (if any)	**Industrial Exposure & Project Work**	**6 Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7 Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 44		**Tutorials = 0**	**Practical = 0**			

8. Course Description

Course for General Lab covers the experiments of program elective. Students have to perform the experiment from the List.

9. Course Objectives

The objectives of the General Lab include:

1. To give students the opportunity to learn experiments from program electives
2. To provide students with opportunities for practical, hands-on learning on the students' areas of specialization.
3. To enhance the employability skills of the students.

10. Course Outcomes: The learning outcomes can be as follows:

1 Apply theoretical knowledge in industrial applications.
2 Acquire technical skills on the students' areas of specialization.

11 Lab Experiments:

Section A: Microwave in MIC's

1. Characteristics of Gunn diode, Frequency and wavelength measurement
2. Characteristics of Reflex Klystron
3. Characteristics of Multi-hole directional coupler
4. Characteristics of Circulator and Isolator
5. Micro strip antenna design using HFSS

Section B: Optical Communication

6. To establish analog link using Optical Fiber
7. To Transmit and receive Pulse Amplitude Modulated (PAM) signal using OF.
8. To measure Propagation loss in optical fiber.
9. To measure bending loss in optical fiber.
10. To measure numerical aperture of optical fiber.
11. To study splicing & connecterization.

Section C: ARduino Programming & Introduction to Respberry Pi

12. Introduction to Arduino Programming
13. Introduction to Python Programming
14. Implementation of IoT with Raspberry Pi
15. Study of Connectivity and configuration of Raspberry-Pi /Beagle board circuit with basic peripherals, LEDS.

Section D: Verilog Programming

16. To learn designing basic combinational circuits in Verilog and implementing them on an FPGA.
17. Understanding the ASIC/FPGA design flow.
18. Learn writing and using test benches in Verilog.
19. To develop a basic SNAKE game by interfacing a PS/2 Keyboard and VGA display with the board

1 Name of the Department: Electronics and Communication Engineering						
2 Course Name	**General Lab V**	**L** **0**	**T** **0**		**P** **2**	
3 Course Code						
4 Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE()**	
5 Pre-requisite (if any)	**Industrial Exposure & Project Work**	**6 Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem()	EverySem ()
7 Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)						
Lectures = 44		**Tutorials = 0**	**Practical = 0**			

8. Course Description

Course for General Lab covers the experiments of program elective. Students have to perform the experiment from the List.

9. Course Objectives

The objectives of the General Lab include:

4. To give students the opportunity to learn experiments from program electives
5. To provide students with opportunities for practical, hands-on learning on the students' areas of specialization.
6. To enhance the employability skills of the students.

10. Course Outcomes: The learning outcomes can be as follows:

3 Apply theoretical knowledge in industrial applications.

4 Acquire technical skills on the students' areas of specialization.

11 Lab Experiments: :

Section A: Satellite communication

1. To set up a active & passive satellite communication link and study their difference.
2. To measure the baseband analog (voice) signal parameters in a satellite link.
3. To transmit & receive the Function Generator waveforms through a satcom link.
4. To send telecommand and receive the telemetry Data.
5. To study the phenomenon of Linear and Circular polarization of antennas.

Section B: RF component Design : Simulator Approved

1. Study of the structure and operation of wired, aperture, planar and array antennas.
2. Measurement of radiation pattern of planar antennas
3. Design and simulation of micro strip antenna using CST tool. 10. Measurement of antenna parameters using Network Analyzer

Section C: Modern Comm. Technologies

1. To study sampling and reconstruction of Pulse Amplitude modulation system.
2. To study sensitivity, selectivity, and fidelity characteristics of super heterodyne receiver.
3. To plot the radiation pattern of dipole ,Yagi-uda and calculate its beam width.

Section D: High Speed Electronics

1. To study single-phase ac voltage regulator with resistive and inductive loads.
2. To study single phase cyclo-converter
3. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
4. To study operation of IGBT/MOSFET chopper circuit