GEETANJALI INSTITUTE OF TECHNICAL STUDIES, UDAIPUR

Department of Electronics & Communication Engineering

COURSE DESCRIPTION

BACHELOR OF TECHNOLOGY

Academic Session 2020-21

Rajasthan Technical University, Akelgarh, Kota, Rajasthan 324010

Vision of Department

To provide quality education through research & innovation to cater the need of industry & society.

Mission of Department

1. To nurture knowledge of students in theoretical and practical aspects in collaboration with industries.
2. To inculcate the students towards research and innovation to fulfill the need of industry & society.
3. To develop socially responsible professionals with values and ethics.

Programme Educational Objectives (PEOs)

The Programme Educational Objectives of the programme offered by the department are listed below:

PEO1: Deliver comprehensive knowledge and skills for successful career in the industries.

PEO2: To Provide conducive environment for becoming a successful entrepreneur and life-long learning.

PEO3: Inculcate research through innovative solution of the real life problems with help of industries.

Programme Outcomes (POs)

A student will develop:

1. **ENGINEERING KNOWLEDGE:** An ability to apply knowledge of Mathematics, Science and Engineering Fundamentals in Electronics and Communication Engineering.
2. **PROBLEM ANALYSIS:** An ability to analyze and interpret data by designing and conducting experiments. Develop the knowledge of developing algorithms, designing, implementation and testing applications in electronics and communication related areas.
3. **DESIGN/ DEVELOPMENT OF SOLUTION:** An ability to Design a system Component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. **CONDUCTION OF INVESTIGATION OF COMPLEX PROBLEMS:** An ability to Identify, formulate and solve engineering problems.
5. **MODERN TOOL USAGE:** An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

6. **THE ENGINEERING AND SOCIETY:** Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
7. **ENVIRONMENT & SUSTAINABILITY:** Understand the impact of professional engineering solution in societal and environmental contexts, and demonstrate the knowledge of, and need of sustainable development.
8. **ETHICS:** An ability to understand the professional, social and ethical responsibility.
9. **INDIVIDUAL AND TEAM WORK:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **COMMUNICATION:** An ability to Communicate effectively in order to succeed in their profession such as, being able to write effective reports and design documentation, make effective presentations.
11. **PROJECT MANAGEMENT & FINANCE:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in team, to manage projects and in multidisciplinary environment.
12. **LIFE-LONG LEARNING:** Recognize the need and an ability to engage in life-long learning.

PSO's (Program Specific Outcomes)

PSO1: Professional Skills: The ability to understand, analyze and develop electronic systems in the areas related to hardware and software development, communication systems and networking for efficient design of electronic-based systems of varying complexity.

PSO2: Problem-Solving Skills: The ability to apply standard practices and strategies in electronic system project development on both hardware and software environments to deliver a quality product for business success.

PSO3: Successful Career and Entrepreneurship: The ability to employ modern electronic solutions on different platforms, in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

SCHEME

I Semester: B. Tech
Common to all branches of UG Engineering & Technology

SN	Categ-ory	Course Code	Course Title	Hours			Marks			Cr
				L	T	P	IA	ETE	Total	
1	BSC	1FY2-01	Engineering Mathematics-I	3	1	-	30	70	100	4
2	BSC	1FY2-02/ 1FY2-03	Engineering Physics/ Engineering Chemistry	3	1	-	30	70	100	4
3	HSMC	1FY1-04/ 1FY1-05	Communication Skills/ Human Values	2	-	-	30	70	100	2
4	ESC	1FY3-06/ 1FY3-07	Programming for Problem Solving/ Basic Mechanical Engineering	2	-	-	30	70	100	2
5	ESC	1FY3-08/ 1FY3-09	Basic Electrical Engineering/ Basic Civil Engineering	2	-	-	30	70	100	2
6	BSC	1FY2-20/ 1FY2-21	Engineering Physics Lab/ Engineering Chemistry Lab	-	-	2	60	40	100	1
7	HSMC	1FY1-22/ 1FY1-23	Language Lab/ Human Values Activities and Sports	-	-	2	60	40	100	1
8	ESC	1FY3-24/ 1FY3-25	Computer Programming Lab/ Manufacturing Practices Workshop	-	-	3	60	40	100	1.5
9	ESC	1FY3-26/ 1FY3-27	Basic Electrical Engineering Lab/ Basic Civil Engineering Lab	-	-	2	60	40	100	1
10	ESC	1FY3-28/ 1FY3-29	Computer Aided Engineering Graphics/ Computer Aided Machine Drawing	-	-	3	60	40	100	1.5
11	SODE CA	1FY8-00							100	0.5
									Total	20.5

L = Lecture, **T** = Tutorial,
P = Practical, IA=Internal Assessment, ETE=End Term Exam, Cr=Credits

II Semester: B. Tech
Common to all branches of UG Engineering & Technology

SN	Catego-ry	Course Code	Course Title	Hours			Marks			Cr
				L	T	P	IA	ETE	Total	
1	BSC	2FY2-01	Engineering Mathematics-II	3	1	-	30	70	**100**	**4**
2	BSC	2FY2-03/ 2FY2-02	Engineering Chemistry/ Engineering Physics	3	1	-	30	70	100	4
3	HSMC	2FY1-05/ 2FY1-04	Human Values/ Communication Skills	2	-	-	30	70	100	2
4	ESC	2FY3-07/ 2FY3-06	Basic Mechanical Engineering/ Programming for Problem Solving	2	-	-	30	70	100	2
5	ESC	2FY3-09/ 2FY3-08	Basic Civil Engineering/ Basic Electrical Engineering	2	-	-	30	70	100	2
6	BSC	2FY2-21/ 2FY2-20	Engineering Chemistry Lab/ Engineering Physics Lab	-	-	2	60	40	100	1
7	HSMC	2FY1-23/ 2FY1-22	Human Values Activities and Sports/ Language Lab	-	-	2	60	40	100	1
8	ESC	2FY3-25/ 2FY3-24	Manufacturing Practices Workshop/ Computer Programming Lab	-	-	3	60	40	100	1.5
9	ESC	2FY3-27/ 2FY3-26	Basic Civil Engineering Lab/ Basic Electrical Engineering Lab	-	-	2	60	40	100	1
10	ESC	2FY3-29/ 2FY3-28	Computer Aided Machine Drawing/ Computer Aided Engineering Graphics	-	-	3	60	40	100	1.5
11	SODE CA	2FY8-00							**100**	**0.5**
									Total	**20.5**

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Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
2nd Year - III Semester

THEORY												
SN	**Category**	**Course**		**Contact hrs/week**			**Marks**				**Cr**
		Code	**Title**	**L**	**T**	**P**	**Exm Hrs**	**IA**	**ETE**	**Total**	
1	BSC	3EC2-01	Advanced Engineering Mathematics-I	3	0	0	3	30	120	**150**	**3**
2	HSMC	3EC1-02/ 3EC1-03	Technical Communication/Managerial Economics and Financial Accounting	2	0	0	2	20	80	**100**	**2**
3	PCC	3EC4-04	Digital System Design	3	0	0	3	30	120	**150**	**3**
4		3EC4-05	Signal & Systems	3	0	0	3	30	120	**150**	**3**
5		3EC4-06	Network Theory	3	1	0	3	40	160	**200**	**4**
6		3EC4-07	Electronics Devices	3	1	0	3	40	160	**200**	**4**
			Sub Total	17	2	0		190	760	**950**	**19**
PRACTICAL & SESSIONAL											
8	PCC	3EC4-21	Electronics Devices Lab	0	0	2		30	20	**50**	**1**
9		3EC4-22	Digital System Design Lab	0	0	2		30	20	**50**	**1**
10		3EC4-23	Signal Processing Lab	0	0	2		30	20	**50**	**1**
11	ESC	3EC3-24	Computer Programming Lab-I	0	0	2		30	20	**50**	**1**
13	PSIT	3EC7-30	Industrial Training	0	0	1				**50**	**1**
14	SODECA	3EC8-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
			Sub- Total	0	0	9		120	80	**275**	**5.5**
		TOTAL OF III SEMESTER		17	2	9		310	840	**1225**	**24.5**

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ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
2nd Year - IV Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	4EC2-01	Advanced Engineering Mathematics-II	3	0	0	3	30	120	**150**	**3**
2	HSMC	4EC1-03/ 4EC1-02	Managerial Economics and Financial Accounting/ Technical Communication	2	0	0	2	10	40	**50**	**2**
3	PCC	4EC4-04	Analog Circuits	3	0	0	3	30	120	**150**	**3**
4		4EC4-05	Microcontrollers	3	0	0	3	30	120	**150**	**3**
5	ESC	4EC3-06	Electronics Measurement & Instrumentation	3	0	0	3	30	120	**150**	**3**
6	PCC	4EC4-07	Analog and Digital Communication	3	0	0	3	30	120	**150**	**3**
		Sub Total		17	0	0		160	640	**800**	**17**
PRACTICAL & SESSIONAL											
8	PCC	4EC4-21	Analog and Digital Communication Lab	0	0	3		45	30	**75**	**1.5**
9		4EC4-22	Analog Circuits Lab	0	0	3		45	30	**75**	**1.5**
10		4EC4-23	Microcontrollers Lab	0	0	3		45	30	**75**	**1.5**
11		4EC4-24	Electronics Measurement & Instrumentation Lab	0	0	3		45	30	**75**	**1.5**
12	SODECA	4EC18-00	Social Outreach, Discipline & Extra Curricular Activities							**25**	**0.5**
		Sub- Total		0	0	12		180	120	**325**	**6.5**
		TOTAL OF IV SEMEESTER		17	0	12		340	760	**1125**	**23.5**

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Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
3rd Year - V Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	ESC	5EC 3-01	Computer Architecture	2	0	0	2	20	80	100	2
2	PCC/ PEC	5EC 4-02	Electromagnetics Waves	3	0	0	3	30	120	150	3
3		5EC 4-03	Control system	3	0	0	3	30	120	150	3
4		5EC 4-04	Digital Signal Processing	3	0	0	3	30	120	150	3
5		5EC 4-05	Microwave Theory & Techniques	3	0	0	3	30	120	150	3
6		Professional Elective I (any one)		2	0	0	2	20	80	100	2
		5EC 5-11	Bio-Medical Electronics								
		5EC 5-12	Embedded Systems								
		5EC 5-13	Probability Theory & Stochastic Process								
		5EC 5-14	Satellite Communication								
		Sub Total		16	0	0		160	640	800	16
PRACTICAL & SESSIONAL											
7	PCC	5EC 4-21	RF Simulation Lab	0	0	3	2	45	30	75	1.5
8		5EC 4-22	Digital Signal Processing Lab	0	0	3	2	45	30	75	1.5
9		5EC 4-23	Microwave Lab	0	0	2	2	30	20	50	1
10	PSIT	5EC 7-30	Industrial Training	0	0	1		75	50	125	2.5
11	SODECA	5EC 8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0			25	25	0.5
		Sub- Total		0	0	9		195	155	350	7
		TOTAL OF V SEMESTER		16	0	9		355	795	1150	23

L: Lecture, **T**: Tutorial, **P**: Practical, **Cr**: Credits

ETE: End Term Exam, **IA**: Internal Assessment

Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
3rd Year - VI Semester

SN	Category	Course Code	Course Title	Contact hrs/week L	T	P	Marks Exm Hrs	IA	ETE	Total	Cr
THEORY											
1	ESC	6EC 3-01	Power Electronics	2	0	0	2	20	80	100	2
2	PCC/ PEC	6EC 4-02	Computer Network	3	0	0	3	30	120	150	3
3		6EC 4-03	Fiber Optics Communications	3	0	0	3	30	120	150	3
4		6EC 4-04	Antennas and Propagation	3	0	0	3	30	120	150	3
5		6EC 4-05	Information theory and coding	3	0	0	3	30	120	150	3
6		Professional Elective II (any one)		3	0	0	3	30	120	150	3
		6EC 5-11	Introduction to MEMS								
		6EC 5-12	Nano Electronics								
		6EC 5-13	Neural Network And Fuzzy Logic Control								
		6EC 5-14	High Speed Electronics								
		Sub Total		17	0	0		170	680	850	17
PRACTICAL & SESSIONAL											
7	PCC	6EC 4-21	Computer Network Lab	0	0	4	2	60	40	100	2
8		6EC 4-22	Antenna and wave propagation Lab	0	0	2	2	30	20	50	1
9		6EC 4-23	Electronics Design Lab	0	0	4	2	60	40	100	2
10		6EC 4-24	Power Electronics Lab	0	0	2	2	30	20	50	1
11	SODECA	6EC 8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0			25	25	0.5
		Sub- Total		0	0	12		180	145	325	6.5
		TOTAL OF VI SEMESTER		17	0	12		350	825	1175	23.5

L: Lecture, **T**: Tutorial, **P**: Practical, **Cr**: Credits

ETE: End Term Exam, **IA**: Internal Assessment

Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
4th Year - VII Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	PEC	Program Elective		3	0	0	3	30	120	**150**	**3**
		7EC5-11	VLSI Design								
		7EC5-12	Mixed Signal Design								
		7EC5-13	CMOS design								
2	OE		Open Elective-I	3	0	0	3	30	120	**150**	**3**
			Sub Total	**6**	**0**	**0**		**60**	**240**	**300**	**6**
PRACTICAL & SESSIONAL											
3	PCC	7EC4-21	VLSI Design Lab	0	0	4	2	60	40	**100**	**2**
4		7EC4-22	Advance communication lab (MATLAB Simulation)	0	0	2	2	30	20	**50**	**1**
5		7EC4-23	Optical Communication Lab	0	0	2	2	30	20	**50**	**1**
6	PSIT	7EC7-30	Industrial Training	1	0	0		75	50	**125**	**2.5**
7		7EC7-40	Seminar	2	0	0		60	40	**100**	**2**
8	SODECA	7EC8-00	Social Outreach, Discipline & Extra Curricular Activities					0	25	**25**	**0.5**
			Sub Total	**3**	**0**	**8**		**255**	**195**	**450**	**9**
			TOTAL of VII SEMESTER	**9**	**0**	**8**		**315**	**435**	**750**	**15**

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Teaching & Examination Scheme
B.Tech. : Electronics & Communication Engineering
4th Year - VIII Semester

THEORY												
SN	**Category**	**Course Code**	**Course Title**	**Contact hrs/week**			**Marks**				**Cr**
				L	**T**	**P**	**Exm Hrs**	**IA**	**ETE**	**Total**	
1	PEC		Program Elective	3	0	0	3	30	120	**150**	**3**
		8EC5-11	Artificial Intelligence And Expert Systems								
		8EC5-12	Digital Image and Video Processing								
		8EC5-13	Adaptive Signal Processing								
2	OE		Open Elective-II	3	0	0	3	30	120	**150**	**3**
			Sub Total	**6**	**0**	**0**		**60**	**240**	**300**	**6**
PRACTICAL & SESSIONAL											
3	PCC	8EC4-21	Internet of Things (IOT) Lab	0	0	2	2	30	20	**50**	**1**
4		8EC4-22	Skill Development Lab	0	0	2	2	30	20	**50**	**1**
5	PSIT	8EC7-50	Project	3	0	0		210	140	**350**	**7**
6	SODECA	8EC8-00	Social Outreach, Discipline & Extra Curricular Activities						25	**25**	**0.5**
			Sub Total	**3**	**0**	**4**		**270**	**205**	**475**	**9.5**
			TOTAL of VIII SEMESTER	**9**	**0**	**4**		**330**	**445**	**775**	**15.5**

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List of Open Electives for Electronics & Communication Engineering				
Subject Code	**Title**		**Subject Code**	**Title**
Open Elective - I			**Open Elective - II**	
7AG6-60.1	Human Engineering and Safety		8AG6-60.1	Energy Management
7AG6-60.2	Environmental Engineering and Disaster Management		8AG6-60.2	Waste and By-product Utilization
7AN6-60.1	Aircraft Avionic System		8AN6-60.1	Finite Element Methods
7AN6-60.2	Non-Destructive Testing		8AN6-60.2	Factor of Human Interactions
7CH6-60.1	Optimization Techniques		8CH6-60.1	Refinery Engineering Design
7CH6-60.2	Sustainable Engineering		8CH6-60.2	Fertilizer Technology
7CR6-60.1	Introduction to Ceramic Science & Technology		8CR6-60.1	Electrical and Electronic Ceramics
7CR6-60.2	Plant, Equipment and Furnace Design		8CR6-60.2	Biomaterials
7CE6-60.1	Environmental Impact Analysis		8CE6-60.1	Composite Materials
7CE6-60.2	Disaster Management		8CE6-60.2	Fire and Safety Engineering
7CS6-60.1	Quality Management/ISO 9000		8CS6-60.1	Big Data Analytics
7CS6-60.2	Cyber Security		8CS6-60.2	IPR, Copyright and Cyber Law of India
7EE6-60.1	Electrical Machines and Drives		8EE6-60.1	Energy Audit and Demand side Management
7EE6-60.2	Power Generation Sources.		8EE6-60.2	Soft Computing
7ME6-60.1	Finite Element Analysis		8ME6-60.1	Operations Research
7ME6-60.2	Quality Management		8ME6-60.2	Simulation Modeling and Analysis
7MI6-60.1	Rock Engineering		8MI6-60.1	Experimental Stress Analysis
7MI6-60.2	Mineral Processing		8MI6-60.2	Maintenance Management
7PE6-60.1	Pipeline Engineering		8PE6-60.1	Unconventional Hydrocarbon Resources
7PE6-60.2	Water Pollution control Engineering		8PE6-60.2	Energy Management & Policy
7TT6-60.1	Technical Textiles		8TT6-60.1	Material and Human Resource Management
7TT6-60.2	Garment Manufacturing Technology		8TT6-60.2	Disaster Management

COURSE OUTCOMES

1FY2-01: ENGINEERING MATHEMATICS-I

Credit: 4 **Max. Marks: 200 (IA: 40, ETE: 160)**
3L+1T+0P **End Term Exam: 3 Hours**

Course Outcomes:

CO11201.1 Learner will be skilled to estimate volume and surface area of the solid formed by revolution of different curves. Also workout definite integral through Beta and Gamma functions.
CO11201.2 Students will be familiar with the concept of sequence, monotonic sequence, Cauchy's sequence and infinite series. Also workout various method to test convergence and divergence of sequence and infinite series
CO11201.3 Learner will be competent to express a function in term of a series of sine and cosine.
CO11201.4 Students will be able to estimate maxima and minima of multivariable functions using the concept of partial differentiation. Further workout limit, continuity and differentiability of two variable functions
CO11201.5 Learner will be skilled in the technique to evaluate double and triple integration and able to apply the knowledge to determine area, volume, centre of mass and centre of gravity. Further workout vector differentiation and vector integration

Syllabus:

Chapter-1

Calculus: Improper integrals (Beta and Gamma functions) and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Chapter-2

Sequences and Series: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.

Chapter-3

Fourier Series: Periodic functions, Fourier series, Euler's formula, Change of intervals, Half range sine and cosine series, Parseval‟s theorem.

Chapter-4

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.

Chapter-5

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, Centre of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), 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.

Text Book:

1. Thomas' Calculus, George B. Thomas, Jr., Maurice D. Weir, Joel R. Hass, Pearson Educations
2. Calculus with Early Transcendental Functions, James Stewart, Cengage Lerning Publication.
3. Engineering Mathematics, C.B. Gupta, S.R. Singh and Mukesh Kumar, McGraw Hill Education.
4. Engineering Mathematics, S. Pal and S.C. Bhunia, Oxford University Press.
5. Higher Engineering Mathematics, B.V. Ramana, McGraw Hill Education.

2FY2-01: ENGINEERING MATHEMATICS-II

Credit: 4 **Max. Marks: 200 (IA:40, ETE:160)**
3L+1T+0P **End Term Exam: 3 Hours**

Course Outcomes:

CO11201.1 Able to calculate rank of matrix, characteristic equation & characteristic roots & use the applicability of Caylay Hamilton Theorem to find inverse of matrix which is very important in many engineering application.
CO11201.2 Students understand various methods to solve ordinary differential equation of first and higher order. Which place important role in all branches of Engineering?
CO11201.3 Students understand various methods to solve ordinary differential equation of second order with variable coefficient which is useful for solving the practical problems which arise in the industry.
CO11201.4 To understand the concept of PDE, including formation and solution of linear and non linear PDE. Further discussion about Lagrange's method, standard form and Charpit method to solve PDE
CO11201.5 To understand the classification of second order PDE including the solution of one dimensional wave and Hear equation by method of separation of variables with boundary condition.

Syllabus:

Chapter- 1

Matrices: Rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Chapter- 2

First order ordinary differential equations: Linear and Bernoulli's equations, exact equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut‟s type.

Chapter- 3

Ordinary differential equations of higher orders: Linear Differential Equations of Higher order with constant coefficients, Simultaneous Linear Differential Equations, Second order linear differential equations with variable coefficients: Homogenous and Exact forms, one part of CF is known, Change of dependent and independent variables, method of variation of parameters, Cauchy- Euler equation; Power series solutions including Legendre differential equation and Bessel differential equations.

Chapter- 4

Partial Differential Equations – First order: Order and Degree, Formation; Linear Partial differential equations of First order, Lagrange's Form, Non Linear Partial Differential equations of first order, Charpit‟s method, Standard forms.

Chapter- 5

Partial Differential Equations– Higher order: Classification of Second order partial differential equations, Separation of variables method to simple problems in Cartesian coordinates including two dimensional Laplace, one dimensional Heat and one dimensional wave equations

Text Books:

1. Advanced Engineering Mathematics, Peter O Neil, Cengage Learning Publication.
2. Advanced Engineering Mathematics, 4th Edition, Dennis G. Zill, Warren S. Wright,Jones & Bartlett Publications.
3. Engineering Mathematics, S. Pal and S.C. Bhunia, Oxford University Press.
4. Engineering Mathematics, C.B. Gupta, S.R. Singh and Mukesh Kumar, McGrawHill Education.
5. Advanced Engineering Mathematics, Jain and Iyengar, Narosa Publications.

1FY2-02/ 2FY2-02: ENGINEERING PHYSICS

Credit: 4 **Max. Marks: 200 (IA: 40, ETE: 160)**
3L+1T+0P **End Term Exam: 3 Hours**

Course Outcomes:

CO12201.1 Understand the concept of interference and diffraction to explain various wave optical phenomena
CO12201.2 To develop the concept of quantum mechanics and apply the knowledge to 1D and 3D potential box problem
CO12201.3 Understand the concept of coherence in source of light and basics of an optical fiber: working principle and construction, NA and acceptance angle of an Optical Fiber
CO12201.4 Understand the working of a LASER and basics of material science & characterization of materials
CO12201.5 Understanding Electromagnetism with the help of Maxwell's equation and formulate the electromagnetic energy transformation theorem

Syllabus:

Chapter-1

Wave Optics: Newton‟s Rings, Michelson‟s Interferometer, Fraunhofer Diffraction from a Single Slit. Diffraction grating: Construction, theory and spectrum, Resolving power and Rayleigh criterion for limit of resolution, Resolving power of diffraction grating, X-Ray diffraction and Bragg‟s Law.

Chapter-2

Quantum Mechanics: Introduction to quantum Mechanics, Wave-particle duality, Matter waves, Wave function and basic postulates, Time dependent and time independent Schrödinger's Wave Equation, Physical interpretation of wave function and its properties, Applications of the Schrödinger's Equation: Particle in one dimensional and three dimensional boxes.

Chapter-3

Coherence and Optical Fibers: Spatial and temporal coherence: Coherence length; Coherence time and „Q‟ factor for light, Visibility as a measure of Coherence and spectral purity, Optical fiber as optical wave guide, Numerical aperture; Maximum angle of acceptance and applications of optical fiber.

Chapter-4

Laser: Einstein's Theory of laser action; Einstein's coefficients; Properties of Laser beam, Amplification of light by population inversion, Components of laser, Construction and working of He-Ne and semiconductor lasers, Applications of Lasers in Science, engineering and medicine.

Chapter-5

Material Science & Semiconductor Physics: Bonding in solids: covalent and metallic bonding, Energy bands in solids: Classification of solids as Insulators, Semiconductors and Conductors, Intrinsic andextrinsic semiconductors, Fermi dirac distribution function and Fermi energy, Conductivity in semiconductors, Hall Effect: Theory, Hall Coefficient and applications**.**

Chapter-6

Introduction to Electromagnetism: Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential, Bio-Savart law, Divergence and curl of static magnetic field, Faraday's law, Displacement current and magnetic field arising from time dependent electric field, Maxwell's equations, Flow of energy and Pointing vector.

Text Books:

1. Engineering Physics: Malik and Singh (Tata McGraw Hill)
2. Engineering Physics: Naidu (Pearson)
3. Optics : Ajay Ghatak (Tata McGraw Hill)
4. Concept of Modern Phyiscs: A. Baiser (Tata McGraw Hill)
5. Fundamental of Optics : Jetkins and White (Tata McGraw Hill)
6. Material Science: Smith (McGraw Hill)

1FY2-03/ 2FY2-03: ENGINEERING CHEMISTRY

Credit: 4 **Max. Marks: 200 (IA: 40, ETE: 160)**
3L+1T+0P **End Term Exam: 3 Hours**

Course Outcomes:

CO11203.1 Differentiation between hard and soft water, solve the related numerical problems on water treatment; and its application in industries and daily life
CO11203.2 Comprehension of various types of fuel, instrumental techniques for analysis and solve the numerical problems related to it
CO11203.3 Identification of corrosion and application of its knowledge to protect the metal
CO11203.4 Developing basic knowledge of Inorganic Engineering materials viz. cement, glass, lubricants
CO11203.5 basic knowledge of organic reaction mechanism and introduction of drugs

Syllabus:

Chapter-1

Water:Common impurities, hardness, determination of hardness by complex metric (EDTA method), Degree of hardness, Units of hardness Municipal water supply: Requisite of drinking water, Purification of water; sedimentation, filtration, disinfection, breakpoint chlorination. Boiler troubles: Scale and Sludge formation, Internal treatment methods, Priming and Foaming, Boiler corrosion and Caustic embrittlement Water softening; Lime-Soda process, Zeolite (Permutit) process, Demineralization process. Numerical problems based on Hardness, EDTA, Lime-Soda and Zeolite process.

Chapter-2

Organic Fuels: Solid fuels: Coal, Classification of Coal, Proximate and Ultimate analyses of coal and its significance, Gross and Net Calorific value, Determination of Calorific value of coal by Bomb Calorimeter. Metallurgical coke, Carbonization processes; Otto-Hoffmann by- product oven method. Liquid fuels : Advantages of liquid fuels, Mining, Refining and Composition of petroleum, Cracking, Synthetic petrol, Reforming, Knocking, Octane number, Anti-knocking agents, Cetane number Gaseous fuels; Advantages, manufacturing, composition and Calorific value of coal gas andoil gas, Determination of calorific value of gaseous fuels by Junker's calorimeter, Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulongs formula, proximate analysis & ultimate and combustion of fuel.

Chapter-3

Corrosion and its control: Definition and significance of corrosion, Mechanism of chemical (dry) and electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion. Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design

Chapter-4

Annealing, Types and properties of soft glass, hard glass, borosilicate glass, glass wool, safety glass Lubricants: Classification, Mechanism, Properties; Viscosity and viscosity index, flash and firepoint,cloudandpourpoint. Emulsification and steam emulsion number.

Chapter-5

Organic reaction mechanism and introduction of drugs: Organic reaction mechanism: Substitution; SN1, SN2, Elecrophilic aromatic substitution in benzene, free radical halogenations of alkanes, Elimination; elimination in alkyl halides, dehydration of alcohols, Addition: electrophilic and free radical addition in alkenes, nucleophilic addition in aldehyde and ketones, Rearrangement; Carbocation and free radical rearrangements Drugs : Introduction, Synthesis, properties and uses of Aspirin, Paracetamol

Text Books:

1. Engineering Chemistry by Monica Jain and P C Jain, Dhanpat Rai Publishing Company
2. Engineering Chemistry Wiley, India.
3. The Chemistry and Technology of Coal, by J G Speigh, CRC Press.
4. The Chemistry and Technology of Petroleum, by J G Speigh, CRC Press

1FY1-04/ 2FY1-04: COMMUNICATION SKILLS

Credit: 2 **Max. Marks: 100 (IA: 20, ETE: 80)**
2L+0T+0P **End Term Exam: 2 Hours**

Course Outcomes:

CO11104.1 & CO12104.1 Students will be able to understand and develop communication skills and techniques which will felicitate their ability to work collaboratively with others
CO11104.2 & CO12104.2 Students will be able to use English grammar accurately that will increase their confidence in English writing and speaking
CO11104.3& CO12104.3 Students will be able to invent, draft, organize, abstract, elaborate and synthesize their own and other's ideas in formatted way
CO11104.4 & CO12104.4 Students will be able to understand literary devices after reading stories and also leran about parts of speech and vocabulary
CO11104.5 & CO12104.5 Students will be able to understand literary devices and figure of speech after reading poems and also appreciate art in all forms

Syllabus:

Chapter-1

Communication: Meaning, Importance and Cycle of Communication. Media and Types of Communication. Verbal and Non-Verbal communication. Barriers to communication. Formal and Informal Channels of Communication (Corporate Communication). Divisions of Human Communication and Methods to improve Interpersonal Communication. Qualities of good communication

Chapter-2

Grammar: Passive Voice. Reported Speech. Conditional Sentences. Modal Verbs. Linking Words (Conjunctions)

Chapter-3

Composition: Job Application and Curriculum-Vitae Writing Business Letter Writing paragraph writing. Report Writing

Chapter-4

Short Stories:v "Luncheon" by Somerset Maugham."How Much Land Does a Man Need?" by Count Leo Tolstoy. "The Night Train at Deoli" by Ruskin Bond.

Chapter-5

Poems: "No Men are Foreign" by James Kirkup. "If" by Rudyard Kipling. "Where the Mind is without Fear" by Rabindranath Tagore.

Text Books:

1. Communication Skills, Pushplata & Sanjay Kumar, Oxford University Press, India.
2. The Written Word, Vandana Singh, Oxford University Press, India.
3. Current English Grammar and Usage with Composition, R. P. Sinha, Oxford University Press, India.
4. Rodriques M. V., 'Effective Business Communication', Concept Publishing Company, New Delhi, 1992 reprint (2000).
5. Bansal, R K and Harrison J B, 'Spoken English' Orient Longman, Hyderabad.
6. Binod Mishra & Sangeeta Sharma, 'Communication Skills for Engineers and Scientists, PHI Learning Private Ltd, New Delhi, 2011.
7. Gartside L. 'Modern Business Correspondence, Pitman Publishing, London.

1FY1-05/ 2FY1-05: HUMAN VALUES

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

Course Outcomes:

CO11105.1 & CO12105.1 Students will understand the importance of Happiness through Identification of Human Values and Skills**.**
CO11105.2 & CO12105.1 Students will understand the role of basic human aspirations in self and people around them.
CO11105.3 & CO12105.1 Students will understand about the harmony in family, in society and practically understand the importance of trust and respect as foundational value of relationship
CO11105.4 & CO12105.1 Students will understand the interconnectedness among the four orders of nature, recyclability, coexistence and harmony at all level of existence
CO11105.5 & CO12105.1 Students will understand to be prepared for humanistic education, professional competence with ethics and humanistic universal order.

Syllabus:

Chapter-1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, Self Exploration - its content and process; „Natural Acceptance‟ and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

Chapter-2

Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient „I‟ and the material „Body "Understanding the needs of Self („I‟) and „Body‟ - Sukh and Suvidha Understanding the Body as an instrument of „I", Understanding the characteristics and activities of „I‟ and harmony in „I‟ Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

Chapter-3

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) , meaning of Vishwas; Difference between intention and competence, meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, harmony in the society , Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals ,Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family.

Chapter-4

Understanding Harmony in the Nature and Existence- Whole existence as Coexistence Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all pervasive Space. Holistic perception of harmony at all levels of existence

Chapter-5

Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, (b) Ability to identify the scope and characteristics of people-friendly and eco- friendly production systems, technologies and management models. Strategy for transition from the present state to Universal Human Order: (a). at the level of individual: as socially and ecologically responsible engineers, technologists and managers. (b). at the level of society: as mutually enriching institutions and organization.

Case studies related to values in professional life and individual life.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2009. ISBN: 978-9-350-62091-5
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press.
5. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
6. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
7. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
8. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
9. A N Tripathy, 2003, Human Values, New Age International Publishers.
10. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
11. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
12. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
13. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
14. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

1FY3-06/ 2FY3-06: PROGRAMMING FOR PROBLEM SOLVING

Credit: 2 **Max. Marks: 100 (IA: 20, ETE: 80)**
2L+0T+0P **End Term Exam: 2 Hours**

Course Outcomes:

CO11306.1 To get the basic knowledge of computer & problem solving through algorithms & flowchart
CO11306.2 To translate the algorithms to programs & execution (in C language)
CO11306.3 To implements conditional branching, iteration
CO11306.4 To decompose a problem into functions and to develop modular reusable code
CO11306.5 To use arrays, pointers and structures to develop algorithms and programs

Syllabus:

Chapter-1

Fundamentals of Computer: Stored program architecture of computers, Storage device- Primary memory, and Secondary storage, Random, Direct, Sequential access methods, Concepts of High- level, Assembly and Low-level languages, Representing algorithms through flowchart and pseudo code.

Chapter-2

Number system: Data representations, Concepts of radix and representation of numbers in radix r with special cases of r=2, 8, 10 and 16 with conversion from radix r1 to r2, r‟s and (r-1)‟s complement, Binary addition, Binary subtraction, Representation of alphabets.

Chapter-3

C Programming: Problem specification, flow chart, data types, assignment statements, input output statements, developing simple C programs, If statement, for loops, while loops, do-while loops, switch statement, break statement, continue statement, development of C programs using above statements, Arrays, functions, parameter passing, recursion, Programming in C using these statements, Structures, files, pointers and multi file handling.

Text Books:

1. Fundamental of Computers By R. Thareja**,** Oxford University Press.
2. Programming in ANSI C by E Balagurusamy, Tata McGraw-Hill Education.
3. The C Programming Language by Brian W. Kernighan and Dennis M. Ritchie, PHI.
4. C: The Complete Reference by Herbert Schildt, McGraw-Hill Education.
5. Let us C by Yashavant P. Kanetkar, bpb publications
6. Programming in C by Thareja, Oxford University Press
7. Graphics Under C by Yashavant P. Kanetkar, bpb publications.

1FY3-07/ 2FY3-07: BASIC MECHANICAL ENGINEERING

Credit: 2 **Max. Marks: 100 (IA: 20, ETE: 80)**
2L+0T+0P **End Term Exam: 2 Hours**

Course Outcomes:

CO11307.1 & CO12307.1 Students will be able to understand the introduction of mechanical engineering and develop knowledge about steam boilers, steam turbines and power plants**.**
CO11307.2 & CO12307.2 Students will be able to conclude basics of centrifugal, reciprocation pumps and Internal Combustion Engine. Students will be able to create knowledge of various types of refrigeration and air conditioning systems with their applications.
CO11307.3 & CO12307.3 Students will be able to analyze basics of different type's power transmission systems such as belt, rope, gears and gear trains
CO11307.4 & CO12307.4 Students will be able to illustrate working of different manufacturing processes
CO11307.5 & CO12307.5 Students will be able to identify different engineering materials there, properties and various types of heat treatment processes

Syllabus:

Chapter-1

Fundamentals: Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. Steam Boilers classification and types of steam boilers and steam turbines. Introduction and Classification of power plants

Chapter-2

Pumps and IC Engines: Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components

Chapter-3

Refrigeration and Air Conditioning: Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning

Chapter-4

Transmission of Power: Introduction and types of Belt and Rope Drives, Gears.

Chapter-5

Primary Manufacturing Processes: Metal Casting Process: Introduction to Casting Process, Patterns, Molding, and Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.

Chapter-6

Engineering Materials and Heat Treatment of Steel: Introduction to various engineering materials and their properties.

Text Books:

1. G. Shanmugam and S Ravindran, Basic Mechanical Engieering, Mc Graw hill, fourth edition.
2. K Venu Gopal and Prabhu Raja V, Basic Mechanical Engineering, Anuradha agencies pub, Chennai.

1FY3-08/ 2FY3-08: BASIC ELECTRICAL ENGINEERING

Credit: 2 **Max. Marks: 100 (IA: 20, ETE: 80)**
2L+0T+0P **End Term Exam: 2 Hours**

Course Outcomes:

CO12308.1 Ability to solve circuit using different kind of methods and theorems
CO12308.2 Ability to know the behaviors of basic electrical elements like resistor, inductor and capacitor
CO12308.3 Students will be able to know the behaviors of transformer.
CO12308.4 Students will be able to know the behaviors of AC and DC machines.
CO12308.5 Students can use electronics components in the circuit after understanding its properties. Ability to know the behavior of LT switchgear, earthling and electrical power measurement

Syllabus:

Chapter-1

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, Series-Parallel circuits, Node voltage method, Mesh current method, Superposition, Thevenin‟s, Norton‟s and Maximum power transfer theorems.

Chapter-2

AC Circuits: Representation of sinusoidal waveforms, peak and r.m.s values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC and RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

Chapter-3

Transformers: Ideal and practical transformer, EMF equation, equivalent circuit, losses in transformers, regulation and efficiency.

Chapter-4

Electrical Machines: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Starting and speed control of induction motor, single- phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited DC motor. Construction and working of synchronous generators.

Chapter-5

Power Converters: Semiconductor PN junction diode and transistor (BJT). Characteristics of SCR, power transistor and IGBT. Basic circuits of single phase rectifier with R load, Single phase Inverter, DC-DC converter.

Chapter-6

Electrical Installations: Layout of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, Type of earthing. Power measurement, elementary calculations for energy consumption

Text Books:

1. Basic Electrical and Electronics Engineering by Sukhija and Nagsarkar, Oxford Pub.
2. Basic Electrical & Electronics Engineering by Kothari, Nagrath, TMH
3. Basic Electrical & Electronics Engineering by V. Jagathesan, K. Vinod Kumar & R. Saravan Kumar, Wiley India.
4. Basic Electrical & Electronics Engineering by Prasad/Sivanagraju, Cengage learning Indian Edition
5. Basic Electrical and Electronics Engineering by Muthusubrmaniam, TMH
6. Fundamentals of Electrical and Electronics Engineering by Ghosh, Smarajit, PHIIndia
7. Basic Electrical & Electronics Engineering by Ravish Singh, TMH
8. Electrical and Electronic Technology by Edward Hughes et al, Pearson Publication

1FY3-09/ 2FY3-09: BASIC CIVIL ENGINEERING

Credit: 2 **Max. Marks: 100 (IA: 20, ETE: 80)**
2L+0T+0P **End Term Exam: 2 Hours**

Course Outcomes:

CO12309.1 Role of civil engineer and impact of infrastructure on society will be understood to students.
CO12309.2 Principles of surveying and levelling will be known to students.
CO12309.3 Student will be able to understand about foundation and parts of building
CO12309.4 Importance of transportation and traffic engineering will be known to students.
CO12309.5 Students will understand about problem related to environment.

Syllabus:

Chapter-1

Introduction to objective, scope and outcome the subject

Chapter 2

Introduction: Scope and Specialization of Civil Engineering, Role of civil Engineer in Society, Impact of infrastructural development on economy of country.

Chapter 3

Surveying: Object Principles & Types of Surveying; Site Plans, Plans& Maps; Scales & Unit of different Measurements.
Linear Measurements: Instruments used. Linear Measurement by Tape, Ranging out Survey Lines and overcoming Obstructions; Measurements on sloping ground; Tape corrections, conventional symbols. Angular Measurements: Instruments used; Introduction to Compass Surveying, Bearings and Longitude & Latitude of a Line, Introduction to total station.
Leveling: Instrument used Object of leveling, Methods of leveling in brief, and Contour maps.

Chapter 4

Buildings: Selection of site for Buildings, Layout of Building Plan, Types of buildings, Plinth area, carpet area, floor space index, Introduction to building byelaws, concept of sun light and ventilation. Components of Buildings & their functions, Basic concept of R.C.C., Introduction to types of foundation

Chapter 5

Transportation: Introduction to Transportation Engineering; Traffic and Road Safety: Types and Characteristics of Various Modes of Transportation; Various Road Traffic Signs, Causes of Accidents and Road Safety Measures.

Chapter 6

Environmental Engineering: Environmental Pollution, Environmental Acts and Regulations, Functional Concepts of Ecology, Basics of Species, Biodiversity, Ecosystem, Hydrological Cycle; Chemical Cycles: Carbon, Nitrogen& Phosphorus; Energy Flow in Eco-systems.
Water Pollution: Water Quality standards, Introduction to Treatment & Disposal of Waste Water. Reuse and Saving of Water, Rain Water Harvesting. Solid Waste Management: Classification of Solid Waste, Collection,Transportation and Disposal of Solid. Recycling of Solid Waste: Energy Recovery, Sanitary Land fill, On-Site Sanitation. Air& Noise Pollution: Primary and Secondary air pollutants, Harmful effects of Air Pollution, Control of Air Pollution. . Noise Pollution Harmful Effects of noise pollution, control of noise pollution, Global warming& Climate Change, Ozone depletion, Green House effect

Text Books:

1. Palancharmy, Basic Civil Engineering, McGraw Hill publishers.
2. Satheesh Gopi, Basic Civil Engineering, Pearson Publishers.
3. Ketki Ranwala Dalal, Essentials of Civil Engineering, Charotar Publishing House.

1FY2-20/ 2FY2-20: ENGINEERING PHYSICS LAB

Credit: 1 **Max. Marks: 50 (IA: 30, ETE: 20)**
0L+0T+2P

Course Outcomes:

CO11220.1 & CO12220.1 Student will be able to measure the wavelength of light using Michelson's Interferometer, Newton's Ring and Diffraction Grating, dispersive power of a prism, numerical aperture of an optical fiber, coherence length as well as coherence time of a He-Ne LASER using Michelson's Interferometer and thereby learn the optical phenomena of classical and quantum wave optics.
CO11220.2 & CO12220.2 Student will be able to measure the band gap of a semiconductor material and Hall coefficient of a semiconductor by measuring it's Hall voltage and thereby learn the experimental technique to measure energy band gap and Hall coefficient of a semiconductor and learn to identify the type of semiconductor (p-type or n-type)
CO11220.3 & CO12220.3 Student will be able to measure the height of a distant object using Sextant and hence learn the use of a sextant to measure angle of inclination as well as learn the use of trigonometric ratios to find various distances.
CO11220.4 & CO12220.4 Student will be able to measure the time constant of a RC circuit, specific resistance of a wire by Carry Foster's bridge and hence learn the charging and discharging behaviour of a capacitor.

List of Experiments:

1. To determine the wave length of monochromatic light with the help of Michelson's interferometer
2. To determine the wave length of sodium light by Newton's Ring.
3. To determine the wave length of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
4. Determination of band gap using a P-N junction diode.
5. To determine the height of given object with the help of sextant.
6. To determine the dispersive power of material of a prism with the help of spectrometer.
7. To study the charge and discharge of a condenser and hence determine the same constant (both current and voltage graphs are to be plotted.
8. To determine the coherence length and coherence time of laser using He – Ne laser.
9. To measure the numerical aperture of an optical fiber.
10. To study the Hall Effect and determine the Hall Voltage and Hall coefficients

1FY2-21/ 2FY2-21: ENGINEERING CHEMISTRY LAB

Credit: 1 **Max. Marks: 50 (IA: 30, ETE: 20)**
0L+0T+2P

Course Outcomes:

CO11122.1 & CO12122.1 Students will learn to pronounce and transcribe words after learning various phonetic symbols. They can also use this phonetics to improve their pronunciation.

CO11122.1 & CO12122.2 Students will get a revised knowledge of synonyms, antonyms and word formation.

CO11122.1 & CO12122.3 Students will be able to give seminar presentation on different topics and have knowledge of group discussion.

List of Experiments:

1. Determination the hardness of water by EDTA method
2. Determination of residual chlorine in water
3. Determination of dissolved oxygen in water
4. Determination of the strength of Ferrous Ammonium sulphate solution with the help of K2Cr2O7 solution by using diphenyl amine indicator
5. Determination of the strength of CuSO4 solution iodometrically by using hypo solution
6. Determination of the strength of NaOH and Na2CO3 in a given alkali mixture
7. Proximate analysis of Coal
8. Determination of the flash & fire point and cloud & pour point of lubricating oil
9. Determination of the kinematic viscosity of lubricating oil by Redwood viscometer no. 1 at different temperature Synthesis of Aspirin/ Paracetamol

1FY2-22/ 2FY2-22: LANGUAGE LAB

Credit: 1 **Max. Marks: 50 (IA: 30, ETE: 20)**
0L+0T+2P

Course Outcomes:

CO11123 & CO12123.1 Students will understand the importance of happiness and prosperity through identification of human values and skills**.**
CO11123 & CO12123.2 Students will understand the role of basic human aspirations, about harmony in family, society and the importance of trust and respect.
CO11123 & CO12123.3 Students will understand about the interconnectedness among the four orders of nature, recyclability, coexistence, professional ethics and competence.

List of Experiments:

1. Phonetic Symbols and Transcriptions.
2. Extempore.
3. Group Discussion.
4. Dialogue Writing
5. Listening comprehension.

Text Books:

1. Technical Communication: principles and Practice, Meenakshi Raman & Sangeeta Sharma, Oxford University Press, India.
2. Effective Technical Communication, Barun K. Mitra, Oxford University Press, India.
3. Binod Mishra & Sangeeta Sharma, 'Communication Skills for Engineers and Scientists, PHI Learning Private Ltd, New Delhi, 2011.
4. Communication Skills, Pushplata & Sanjay Kumar, Oxford University Press, India.
5. Bhattacharya, Indrajit, An Approach to Communication Skills, Dhanpat Rai & Co. (Pvt) Ltd., New Delhi.
6. Wright, Crissy, Handbook of Practical Communication Skills, Jaico Publishing House, Mumbai.
7. Gimson, A C, 'An Introduction to the Pronunciation of English', ELBS.

1FY1-23/ 2FY1-23: HUMAN VALUES ACTIVITIES AND SPORTS

Credit: 1 **Max. Marks: 50 (IA: 30, ETE: 20)**
0L+0T+2P

Course Outcomes:

CO12105.1 Students will understand the importance of Happiness through Identification of Human Values and Skills.
CO12105.2 Students will understand the role of basic human aspirations in self and people around them.
CO11105.3 Students will understand about the harmony in family, in society and practically understand the importance of trust and respect as foundational value of relationship
CO11105.4 Students will understand the interconnectedness among the four orders of nature, recyclability, coexistence and harmony at all level of existence
CO11105.5 Students will understand to be prepared for humanistic education, professional competence with ethics and humanistic universal order.

Content:

PS 1: Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your salient achievements and shortcomings in your life? Observe and analyze them.
PS 2: Now-a-days, there is a lot of talk about many techno-genic maladies such as energy and material resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be manmade problems, threatening the survival of life Earth - What is the root cause of these maladies & what is the way out in opinion?
On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, breakdown of relationships, generation gap, depression & suicidal attempts etc. - what do you think, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?
PS 3:

1. Observe that each of us has the faculty of „Natural Acceptance", based on which one can verify what is right or not right for him. (As such we are not properly trained to listen to our „Natural Acceptance" and may a time it is also clouded by our strong per-conditioning and sensory attractions).

Explore the following:

(i) What is Naturally Acceptable" to you in relationship the feeling of respect or disrespect for yourself and for others?

(ii) What is „naturally Acceptable" to you - to nurture or to exploit others? Is your living in accordance with your natural acceptance or different from it?

2. Out of the three basic requirements for fulfilment of your aspirations - right understanding, relationship and physical facilities - observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

PS 4:

1. a. Observe that any physical facility you use, follows the given sequence with time:
Necessary and tasteful - unnecessary but still tasteful - unnecessary and tasteless - intolerable
b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If not acceptable, you want it continuously and if not acceptable, you do not want it any moment!

2. List down all your important activities. Observe whether the activity is of „I" or of Body or with the participation of both or with the participation of both „I" and Body.
Observe the activities within „i". Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

PS 5:

1. Write a narration in the form of a story, poem, skit or essay to clarify a salient Human Value to the children.
2. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to values in a difficult situation.

PS 6: List down some common units (things) of Nature which you come across in your daily life and classify them in the four orders of Nature. Analysis and explain the aspect of mutual fulfillment of each unit with other orders.

PS 7: Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basic of natural acceptance of human values? If so, how should one proceed in this direction from the present situation?

PS 8:

1. Suggest ways in which you can use your knowledge of Science/Technology/Management etc. for moving towards a universal human order.
2. Propose a broad outline for humanistic Constitution at the level of Nation.

Project:

Every student required to take-up a social project e.g. educating children in needy/weaker section; services in hospitals, NGO's and other such work i.e. social work at villages adopted by respective institute/ college.

Sports:

a) Planning in Sports,
b) Sports & Nutrition
c) Yoga and Life style
d) Measures Physical Education & Sports for CWSN (Children with Special needs - Divyang)
e) Children & Sports
f) Women & Sports
g) Test & Measurement in Sports
h) Physiology & Sports
i) Sports Medicine
j) Kinesiology, Biomechanics & Sports
k) Psychology & Sports

1FY3-24/ 2FY3-24: COMPUTER PROGRAMMING LAB

Credit: 1.5 **Max. Marks: 75 (IA: 45, ETE: 30)**
0L+0T+3P

Course Outcomes:

CO11324.1 & CO12324.1 To Design, implement, test and debug programs in C

CO11324.2 & CO12324.2 To implement and learn conditional statements

CO11324.3 & CO12324.3 To implement the different types of array and its applications

CO11324.4 & CO12324.4 To imply practical applications of structure and union

CO11324.5 & CO12324.5 To implement the concept of File Handling

List of Experiments:

1. To learn about the C Library, Pre-processor directive, Input-output statement.
2. Programs to learn data type, variables, If-else statement
3. Programs to understand nested if-else statement and switch statement
4. Programs to learn iterative statements like while and do-while loops
5. Programs to understand for loops for iterative statements
6. Programs to learn about array and string operations
7. Programs to understand sorting and searching using array
8. Programs to learn functions and recursive functions
9. Programs to understand Structure and Union operation
10. Programs to learn Pointer operations
11. Programs to understand File handling operations
12. Programs to input data through Command line argument

1FY3-25/ 2FY3-25: MANUFACTURING PRACTICES WORKSHOP

Credit: 1.5 **Max. Marks: 75 (IA: 45, ETE: 30)**
0L+0T+3P

Course Outcomes:

CO11325.1 & CO12325.1 Student will be able to understand the basic tools and operations of carpentry shop with preparation of a simple joint
CO11325.2 & CO12325.2 Student will be able to understand the basics of foundry shop with preparation of sand mould and casting of simple pattern
CO11325.3 & CO12325.3 Students will be able to describe the basic tools used in welding shop with preparation of lap and butt joint
CO11325.4 & CO12325.4 Students will be able to learn about various parts and operations on Lathe machine with preparation of job
CO11325.5 & CO12325.5 Students will be able to understand the various tools and operations of fitting shop with preparation of job

List of Experiments:

Carpentry Shop

1. T – Lap joint
2. Bridle joint

Foundry Shop

3. Mould of any pattern
4. Casting of any simple pattern

Welding Shop

5. Lap joint by gas welding
6. Butt joint by arc welding
7. Lap joint by arc welding
8. Demonstration of brazing, soldering & gas cutting

Machine Shop Practice

9. Job on lathe with one step turning and chamfering operations

Fitting and Sheet Metal Shop

10. Finishing of two sides of a square piece by filing
11. Making mechanical joint and soldering of joint on sheet metal

To cut a square notch using hacksaw and to drill a hole and tapping

1FY3-26/ 2FY3-26: BASIC ELECTRICAL ENGINEERING LAB

Credit: 1 **Max. Marks: 50 (IA: 30, ETE: 20)**
0L+0T+2P

Course Outcomes:

CO12326.1 Students can identify basic electrical component and able to test and measure electrical quantities using digital and analog meters
CO12326.2 Students gets basic information about transformer.
CO12326.3 Student will be able to understand about star Delta connection of 3 phase transformer
CO12326.4 Students get complete information about AC & DC machine by cut out section
CO12326.5 Students get knowledge of design of different converters and LT switch gears

List of Experiments:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Transformers: Observation of the no-load current waveform on an oscilloscope. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
3. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).Phase-shifts between the primary and secondary side.
4. Demonstration of cut-out sections of machines: dc machine (Commutator - brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
5. Torque Speed Characteristic of separately excited dc motor. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) The use of dc-ac converter for speed control of induction motor and (d) Components of LTswitchgear.

1FY3-27/ 2FY3-27: BASIC CIVIL ENGINEERING LAB

Credit: 1 **Max. Marks: 50 (IA: 30, ETE: 20)**
0L+0T+2P

Course Outcomes:

CO11327 & CO12327.1 To understand the linear measurement with the help of tape and chain include ranging and laying offset method.
CO11327 & CO12327.2 Measurement of bearing of line with help of compass
CO11327 & CO12327.3 To be aware of the of leveling instruments during making of longitudinal and cross section of road and also able to take the measurements using the Total Station.
CO11327 & CO12327.4 Determine various water and waste water quality parameter like pH, hardness, and turbidity and solids.
CO11327 & CO12327.5 Describe the various water supplies and sanitary fitting.

List of Experiments:

1. Linear Measurement by Tape:
   a. Ranging and Fixing of Survey Station along straight line and across obstacles.
   b. Laying perpendicular offset along the survey line
2. Compass Survey: Measurement of bearing of lines using Surveyor's and Prismatic compass
3. Levelling: Using Tilting/ Dumpy/ Automatic Level
   a. To determine the reduced levels in closed circuit
   b. To carry out profile levelling and plot longitudinal and cross sections for road by Height of Instrument and Rise & Fall Method.
4. To study and take measurements using various electronic surveying instruments like EDM, Total Station etc.
5. To determine pH, hardness and turbidity of the given sample of water.
6. To study various water supply Fittings.
7. To determine the pH and total solids of the given sample of sewage.
8. To study various Sanitary Fittings.

1FY3-28/ 2FY3-28: COMPUTER AIDED ENGINEERING GRAPHICS

Credit: 1.5 **Max. Marks: 75 (IA: 45, ETE: 30)**
0L+0T+3P

Course Outcomes:

CO11328 & CO12328.1 Use the drawing instruments effectively and able to dimension the given figure.

CO11328 & CO12328.2 Understand the systematic approach for projection of points & lines.

CO11328 & CO12328.3 Able to draw the basic views related to projection of lines & planes.

CO11328 & CO12328.4 Understand the theory of section of solid & projection of

Section of solid including cylinders, cones, prism

CO11328 & CO12328.5 Understand the fundamentals of computer graphics.

Content:

Introduction: Principles of drawing, lines, type of lines, usage of Drawing instruments, lettering, Conic sections including parabola, hyperbola, Rectangular Hyperbola (General method only); Scales- Plain, Diagonal and Vernier Scales.

Projections of Point & Lines: Position of Point, Notation System, Systematic Approach for projections of points, front view & Top view of point, Position of straight lines, line parallel to Both the RPs, Line perpendicular to either of the RPs, Line inclined to one RP and parallel to the other, Line inclined to Both the RPs, Traces of a line (One drawing sheet, one assignment in sketch book).

Projection of Planes: Positions of planes, Terms used in projections of planes, plane parallel to RP, plane inclined to one RP and perpendicular to the other RP, plane perpendicular to Both the RPs, plane Inclined to Both the RPs, True shape of the plane, Distance of a point from plane, Angle between two planes.
Projections of Regular Solids: frustum and truncated solids, those inclined to both the Planes- Auxiliary Views.

Section of Solids: Theory of sectioning, section of prisms and cubes, section of pyramids and Tetrahedron section of Cylinders, section of cones, section of spheres (One drawing sheet, one assignment in sketch book)

Overview of Computer Graphics: Covering theory of CAD software [such as: The menu System, Toolbars (standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of lines, Planes, Simple and compound Solids.

Text Books:

1. Engineering Drawing Geometrical Drawing P.S.Gill , S.K.Katara & Sons
2. Engineering Drawing,Dhanarajay A Jolhe ,Tata McGraw Hill.
3. Engineering Drawing, Basant Agarwal & CM Agarwal ,Tata McGraw Hill
4. Engineering Drawing, N.D.Bhatt, Charotar Publishing House Pvt. Ltd.
5. Engineering Drawing with an introduction to AutoCAD, Dhananjay A Jolhe
6. Engineering Drawing with AutoCAD, B.V.R. Gupta and M. Rajaroy
7. AutoCAD 2017 for Engineers & Designers (Basic and Intermediate), Sham Tickoo

1FY3-29/ 2FY3-29: COMPUTER AIDED MACHINE DRAWING

Credit: 1.5 **Max. Marks: 75 (IA: 45, ETE: 30)**
0L+0T+3P

Course Outcomes:

CO11329 & CO12329.1 Use the drawing instruments effectively and able to dimension the given figure.
CO11329 & CO12329.2 Understand the systematic approach for projection of points & lines.
CO11329 & CO12329.3 Able to draw the basic views related to projection of lines & planes.
CO11329 & CO12329.4 Understand the theory of section of solid & projection of Section of solid including cylinders, cones, and prism.
CO11329 & CO12329.5 Understand the fundamentals of computer graphics.

Content:

Introduction: Principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, rules of dimensioning.

Conversion of pictorial views into orthographic views: (1 drawing sheet) Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing view problems covering Principles of Orthographic Projections.

Sectional views of mechanical components: (1 drawing sheet) Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, sectioning conventions-spokes, web rib, shaft, pipes, different types of holes, conventions of section lines for different metals and materials.

Fasteners and other mechanical components: (Free hand sketch) Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints. Riveted joints, rivets and riveting, type of rivets, types of riveted joints etc. Bearing: Ball, roller, needle, foot step bearing. Coupling: Protected type, flange, and pin type flexible coupling. Other components: Welded joints, belts and pulleys, pipes and pipe joints, valves etc.

Overview of Computer Graphics: (2 drawing sheets) Covering theory of CAD software such as: The menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (Where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of Lines, Planes, Simple and compound Solids.

3EC2-01: Advance Engineering Mathematics-I

3 Credits **Max. Marks: 150 (IA:30, ETE:120)**
3L:0T:0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	To demonstrate the concept of difference operator and interpolation and to understand of numerical methods over exact analytical methods. Provide approximate the integrals by various numerical methods and idea of numerical solution of ordinary differential equation.
CO 2	To provide the idea of numerical solution of ordinary differential equation of first order using Euler's, Modified Euler's, Mille's, Adams predictor-corrector and Ranga Kutta method.
CO 3	To provide the basic idea of Laplace transform and their application to solve ordinary differential equation with boundary conditions
CO 4	To provide the concept of complex transform including the sine and cosine transform and their application. To solve wave and diffusion equation using Fourier transforms
CO 5	Explain the concept of Z transform and state the use of it in time varying signals able to expand the given periodic function defined in the given range.

SN	Contents	Hours
1	Numerical Methods – 1: Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	**10**
2	Numerical Methods – 2: Numerical solution of ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.	**8**
3	Laplace Transform: Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.	**10**

4	Fourier Transform: Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem, application of Fourier transforms to partial ordinary differential equation (One dimensional heat and wave equations only).	**7**
5	Z-Transform: Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.	**5**
	Total	**40**

3EC1-03: Managerial Economics And Financial Accounting

2 Credit **Max. Marks: 100 (IA:20, ETE:80)**
2L:0T:0P **End Term Exam: 2 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Understand the Economic Concepts and Conventions and will Realize the Need for managerial concepts.
CO 2	Understand the practical application of demand and supply.
CO 3	Will be able to analyze the how to increase demand of different companies
CO 4	Students will be able to Identify economic problems in competitive market.
CO 5	Students will be able to understand the concept of financial accounting

SN	Contents	Hours
1	Basic economic concepts- Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	**4**
2	Demand and Supply analysis- Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	**5**
3	Production and Cost analysis- Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	**5**
4	Market structure and pricing theory- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	**4**
5	Financial statement analysis- Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	**8**
	Total	**26**

3EC4-04: Digital System Design

3 Credits **Max. Marks: 150 (IA:30, ETE:120)**

3L:0T:0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Develop the understanding of number system and its application in digital electronics.
CO 2	Development and analysis of K-map to solve the Boolean function to the simplest form for the implementation of compact digital circuits.
CO 3	Design various combinational and sequential circuits using various metrics: switching speed, throughput/latency, gate count and area, energy dissipation and power.
CO 4	Understanding Interfacing between digital circuits and analog component using Analog to Digital Converter (ADC), Digital to Analog Converter (DAC) etc.
CO 5	Design and implement semiconductor memories, programmable logic devices (PLDs) and field programmable gate arrays (FPGA) in digital electronics.

SN	Contents	Hours
1	Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.	**7**
2	MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU	**8**
3	Sequential Logic Design: Building blocks like S-R, JK and Master- Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of Synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation.	**9**
4	Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using programmable devices.	**8**
5	VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.	**8**
	Total	**40**

3EC4-05: Signals & Systems

3 Credits **Max. Marks: 150 (IA:30, ETE:120)**
3L:0T:0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Analyze different types of signals and systemproperties
CO 2	Represent continuous and discrete systems in time and frequency domain using different transforms
CO 3	Investigate whether the system is stable.
CO 4	Sampling and reconstruction of a signal.
CO 5	Acquire an understanding of MIMO systems

SN	Contents	Hours
1	Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.	**6**
2	Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations	**7**
3	Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases	**8**
4	The Laplace Transform, notion ofeigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.	**6**
5	The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.	**5**
6	State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first- order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.	**8**
	Total	**40**

3EC4-06: Network Theory

3 Credits **Max. Marks: 200 (IA:40, ETE:160)**

3L:1T:0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Apply the basic circuital law and simplify the network using network theorems
CO 2	Appreciate the frequency domain techniques in different applications.
CO 3	Apply Laplace Transform for steady state and transient analysis
CO 4	Evaluate transient response and two-port network parameters
CO 5	Analyze the series resonant and parallel resonant circuit and design filters

SN	Contents	Hours
1	Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality.	**7**
2	Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits.	**7**
3	Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.	**8**
4	Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions..	**8**
5	Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.	**10**
	Total	**40**

3EC4-07: Electronic Devices

4 Credits **Max. Marks: 200 (IA:40, ETE:160)**

3L:1T:0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Understanding the semiconductor physics of the intrinsic, P and N materials.
CO 2	Understanding the characteristics of current flow in a bipolar junction transistor and MOSFET.
CO 3	Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
CO 4	Analyze the characteristics of different electronic devices such as Amplifiers, LEDs,Solar cells, etc.
CO 5	Theoretical as well as experimentalunderstanding of Integrated circuit fabrication.

SN	Contents	Hours
1	Introduction to Semiconductor Physics: Introduction, Energy band gap structures of semiconductors, Classifications of semiconductors, Degenerate and non-degenerate semiconductors, Direct and indirect band gap semiconductors, Electronic properties of Silicon, Germanium, Compound Semiconductor, Gallium Arsenide, Gallium phosphide & Silicon carbide, Variation of semiconductor conductivity, resistance and bandgap with temperature and doping. Thermistors, Sensitors.	**6**
2	Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors.	**6**
3	Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode.	**8**
4	Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell.	**11**
5	Integrated circuit fabrication process: oxidation, diffusion, ion implantation, Photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.	**9**
	Total	**40**

4EC2-01: Advance Engineering Mathematics-II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Students understand the concept of differentiation of complex variable function. Further the use of C-R equation to determine analytic function and construction of analytic function by calculating harmonic conjugate. Use of Milne-thomson's method to get analytic function without constructing the Harmonic conjugate. They understand the concept of conformal mapping and Bilinear transformation.
CO 2	To Understand the concept of complex integration, singularity, poles and Residue of analytic function. Evaluation of complex integration (Contour Integration) using Cauchy's integral theorem, Cauchy's integral formula and Cauchy's Residue theorem. Expansion of complex function in Taylor's and Lurent's series. They also able to apply Liouville's and Maximum modulus theorem.
CO 3	Students are able to evaluate some definite and improper integral by applying the knowledge of Contour integration and residue.
CO 4	Students are able to solve Legendre and Bessel's equations whose solutions are special polynomial. Demonstrate orthogonality and recurrence relation of such polynomial which has wide application in hydrodynamics, theory of elasticity and electrical transmission lines.
CO 5	Students are able to understand the concept of vector space and subspace, their Basis and dimensions. Knowledge of Linearly dependent and independent vectors with applications. They learn the concept of inner product space, Gram-Schmidt orthogonalization process and QR Decomposition.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	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.	**7**
3	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).	**8**
4	Applications of complex integration by residues: Evaluation of definite integral involving sine and cosine. Evaluation of certain improper integrals.	**4**
5	Special Functions: Legendre's function, Rodrigues formula, generating function, Simple recurrence relations, orthogonal property. Bessel's functions of first and second kind, generating function, simple recurrence relations, orthogonal property.	**10**

6	Linear Algebra: Vector Spaces, subspaces, Linear independence, basis and dimension, Inner product spaces, Orthogonality, Gram Schmidt orthogonalization, characteristic polynomial, minimal polynomial, positive definite matrices and canonical forms, QR decomposition.	**10**
	Total	**40**

4EC1-02: Technical Communication

2 Credit **Max. Marks: 100 (IA:20, ETE:80)**
2L:0T:0P **End Term Exam: 2 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Introduction to Technical Communication will let the students know about the fields, scope and career opportunities related to this stream.
CO 2	Acquire basics of concepts, critical/creative thinking and ensure further learning among students through various reading, listening, speaking & writing activities and how to master in language.
CO 3	Develop the knowledge of technical texts, documents and its medium. It will also develop communication competency in speech as well as in writing.
CO 4	Improve the process of technical writing and knowledge of advanced grammar and composition will improve communicative skills, language learning and also helps in students' overall growth & success in future Endeavour's.
CO 5	Acquire basic knowledge of advanced technical writing like technical report, article and proposal that will develop the knowledge of research and presentation skills.

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**1**
2	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communicationskills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	**3**
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructionsand technical manuals, Interpreting and summarizing technical texts, Note- making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	**6**
4	**Technical Writing, Grammar and Editing-** Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	**8**
5	**Advanced Technical Writing-** Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structureof technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	**8**
	Total	**26**

4EC4-04: Analog Circuits

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Understand the characteristics of diodes and transistors
CO 2	Design and analyze various rectifier and amplifiercircuits
CO 3	Design sinusoidal and non-sinusoidal oscillators
CO 4	Understand the functioning of OP-AMP and design OP-AMP based circuits
CO 5	Understanding the designing of ADCs and DACs

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	8
3	High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	8
4	Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	8
5	OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines.	8
6	Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog to digital converters (ADC): Single slope, dual slope, successive approximation, flash etc. Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.	7
	Total	**40**

4EC4-05: Microcontrollers

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Develop assembly language programming skills.
CO 2	Able to build interfacing of peripherals like, I/O, A/D,D/A, timer etc.
CO 3	Develop systems using different microcontrollers.
CO 4	Explain the concept of memory organization.
CO 5	Understand RSIC processors and design ARMmicrocontroller based systems.

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**1**
2	Overview of microcomputer systems and their building blocks, memory interfacing, concepts of interrupts and Direct Memory Access, instruction sets of microprocessors (with examples of 8085 and 8086);	**10**
3	Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters; Arithmetic Coprocessors; System level interfacing design;	**8**
4	Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 286, 486, Pentium; Microcontrollers: 8051 systems,	**10**
5	Introduction to RISC processors; ARM microcontrollers interface designs.	**11**
	Total	**40**

4EC3-06: Electronics Measurement & Instrumentation

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	**Describe** the use of various electrical/electronic instruments, their block diagram, applications, and principles of operation, standards errors and units of measurements.
CO 2	**Develop** basic skills in the design of electronic equipment's.
CO 3	**Analyze** different electrical/electronic parameters usingstate of equipment's of measuring instruments which is require to all types of industries.
CO 4	**Solve:** Identify electronics/ electrical instruments,understanding associated with the instruments
CO 5	**Explain** use of transducers in different types of fieldapplications

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	THEORY OF ERRORS - Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors, Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors.	**8**
3	ELECTRONIC INSTRUMENTS - Electronic Voltmeter, Electronic Multimeters, Digital Voltmeter, and Component Measuring Instruments: Q meter, Vector Impedance meter, RF Power & Voltage Measurements, Introduction to shielding & grounding.	**8**
4	OSCILLOSCOPES – CRT Construction, Basic CRO circuits, CRO Probes, Techniques of Measurement of frequency, Phase Angle and Time Delay, Multibeam, multi trace, storage & sampling Oscilloscopes.	**7**
5	SIGNAL GENERATION AND SIGNAL ANALYSIS - Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis - Measurement Technique, Wave Analyzers, and Frequency - selective wave analyser, Heterodyne wave analyser, Harmonic distortion analyser, and Spectrum analyser.	**8**
6	TRANSDUCERS - Classification, Selection Criteria, Characteristics, Construction, Working Principles and Application of following Transducers:- RTD, Thermocouples, Thermistors, LVDT, Strain Gauges, Bourdon Tubes, Seismic Accelerometers, Tachogenerators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters.	**8**
	Total	**40**

4EC4-07: Analog and Digital Communication

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Analyze and compare different analog modulation schemes for their efficiency and bandwidth
CO 2	Analyze the behavior of a communication system in presence of noise
CO 3	Investigate pulsed modulation system and analyze their system performance
CO 4	Analyze different digital modulation schemes and cancompute the bit error performance
CO 5	Design a communication system comprised of bothanalog and digital modulation techniques

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.	**8**
3	Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation.	**7**
4	Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.	**8**
5	Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.	**8**
6	Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.	**8**
	Total	**40**

5EC3-01: Computer Architecture

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0 **End Term Exam: 2 Hours**

Course Outcome:

Course Outcome	Details
CO 1	**Understand** the basic organization of computer and different instruction formats and addressing modes.
CO 2	**Apply** arithmetic algorithms and interpret the processed data.
CO 3	**Evaluate** various modes of data transfer between CPU and I/O devices..
CO 4	**Discuss** memory organization, memory hierarchy and mapping techniques.
CO 5	**Analyze** the concept of pipelining, parallel processing, DMA and interrupts.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.	**6**
3	Processor organization, Information representation, number formats. Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats	**5**
4	Control Design, Instruction sequencing, Interpretation, Hard wired control Design methods, and CPU control unit. Microprogrammed Control – Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit	**6**
5	Memory organizations, device characteristics, RAM, ROM, Memory management, Concept ofCache & associative memories, Virtual memory.	**5**
6	System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network	**5**
	Total	**28**

5EC4-02: Electromagnetics Waves

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0 **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Students will Understand the basic of transmission lines
CO 2	Students will be able to implement Maxwell's Equations-Basics of Vectors, Vector calculus, Basic laws of Electromagnetic, Maxwell's Equations, Boundary conditions at Media Interface.
CO 3	Students will be able to Uniform Plane Wave-Uniform plane wave, Propagation of wave,
CO 4	Students will be able to Reflection and refraction at dielectric interface.
CO 5	students will be able to Radiation-Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**01**
2	Transmission Lines-Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.	**08**
3	Maxwell's Equations-Basics of Vectors, Vector calculus, Basic laws of Electromagnetics,Maxwell's Equations, Boundary conditions at Media Interface.	**03**
4	Uniform Plane Wave-Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.	**08**
5	Plane Waves at a Media Interface-Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.	**07**
6	Waveguides- Wave propagation in parallel plate waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.	**08**
7	Radiation-Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna	**07**
	Total	**42**

5EC4-03: Control system

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Identify the concept of open and closed loop control systems and implement the mathematical models of physical systems and tools such as SFG and block diagram to analyze the system.
CO 2	Evaluate the time response of the system and stability in time by using Routh-Hurwitz criterion, Root Locus.
CO 3	Analyze the system in frequency domain and hence predict the system stability in frequency domain using Bode plot, polar plots and Nyquist plot and also design compensator in time and frequency domain.
CO 4	Analyze the response and stability of the system represented by state space models
CO 5	Understand the concept of optimal control and nonlinear control.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Introduction to control problem- Industrial Control examples. Transfer function. System with dead-time. System response. Control hardware and their models: potentiometers, synchros, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulicservomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.	**8**
3	Feedback control systems- Stability, steady-state accuracy,transient accuracy, disturbance rejection, insensitivity and robustness. Proportional, integral and derivative systems. Feedforward and multi-loop control configurations, stability concept, relative stability, Routhstability criterion.	**7**
4	Time response of second-order systems- steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.	**6**
5	Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquistplots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.	**8**

6	State variable Analysis- Concepts of state, state variable, state model, state modelsfor linearcontinuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability &observability.	**6**
7	Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, treking problem. Nonlinear system – Basic concept & analysis.	**6**
	Total	**42**

5EC4-04: Digital Signal Processing

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Interpret, represent and process discrete/digital signals and sytems.
CO 2	Thorough understanding of frequency domain analysis of discrete time signals.
CO 3	Understanding of spectral analysis of the signals.
CO 4	Ability to design & analyze DSP systems like FIR and IIR Filter etc.
CO 5	Practical implementation issues such as computational complexity, hardware resource limitations as well as cost of DSP systems or DSP Processors.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems, frequency Analysis, Inverse Systems	**10**
3	Discrete Fourier Transform (DFT), Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems	**9**
4	Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR DigitalFilters: Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and High pass filters.	**10**
5	Effect of finite register length in FIR filter design. Parametric and non- parametric spectral estimation. Introduction to mult-irate signal processing. Application of DSP.	**10**
	Total	**40**

5EC4-05: Microwave Theory & Techniques

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Students will have achieved the ability to: describe microwave transmission modes and transmission lines.
CO 2	Students will have achieved the ability to: analyze microwave networks and measure their measurements parameters.
CO 3	Students will have achieved the ability to: explain the working of various microwave devices
CO 4	Students will have achieved the ability to: Explain working of microwave passive circuits such as isolator, circulator, Directional couplers, attenuators etc
CO 5	Students will have achieved the ability to: identify the modern day applications of microwaves.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Introduction to Microwaves-History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/ EMC.	**4**
3	Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission.	**5**
4	Analysis of RF and Microwave Transmission Lines-Coaxial line, Rectangularwaveguide, Circular waveguide, Strip line, Micro strip line.	**4**
5	Microwave Network Analysis-Equivalent voltages and currents for non- TEMlines, Networkparameters for microwave circuits, Scattering Parameters.	**4**
6	Passive and Active Microwave Devices-Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator.Microwave active components: Diodes, Transistors, Oscillators, Mixers.Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes.Microwave Tubes: Klystron, TWT, Magnetron.	**6**
7	Microwave Design Principles-Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power	

	Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas- Antenna parameters, Antenna for ground based systems, Antennas for airborne and satellite borne systems, Planar Antennas.	**6**
8	Microwave Measurements-Power, Frequency and impedance measurement at microwave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzerand measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure. Measurement of Microwave antenna parameters.	**6**
9	Microwave Systems-Radar, Terrestrial and Satellite Communication, Radio Aidsto Navigation, RFID, GPS. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.	**6**
	Total	**42**

5EC5-11: Bio-Medical Electronics

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

Course Outcome:

Course Outcome	Details
CO 1	students will be able to understand transducer and human psychology
CO 2	students will be able to know how force , displacement and temp changes in human body
CO 3	will have implement Bio-electrodes and biopotential amplifiers , EMG, EEG, etc.
CO 4	will have implement Bio-electrodes and biopotential amplifiers for ECG,.
CO 5	students will have to measure of blood temperature, pressure and flow. Impedance plethysmography

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Brief introduction to human physiology. Biomedical transducers: displacement,velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.	**9**
3	Bio-electrodes and biopotential amplifiers for ECG, EMG, EEG, etc.	**7**
4	Measurement of blood temperature, pressure and flow. Impedance plethysmography. Ultrasonic, X-ray and nuclear imaging.Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped. Safety aspects.	**11**
	Total	**28**

6EC3-01: Power Electronics

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Understand the basic of semiconductor devices related to high power like Power Diodes, Diac, Triac, MOSFETs, IGBT, GTO, Power Transistor and SCR.
CO 2	Analyze working principle of various types of converters.
CO 3	Analyze working principle of various types of inverters.
CO 4	Understand the basic principle of various types of Industrial Power Supplies
CO 5	Conceptualized speed control devices of ac & dc motors.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	SEMICONDUCTOR POWER DEVICES: Introduction. Basic characteristics &working of Power Diodes, Diac, Triac, MOSFETs, IGBT, GTO, Power Transistor and SCR- Principle of operation, V-I Characteristics, Turn-On mechanism and its applications	**6**
3	CONVERTERS: Basic concept, Working Principles of Single phase half Wave bridge converter, Single Phase Full Bridge Converter, 3 Phase Bridge Converter	**5**
4	INVERTERS: Voltage Source Inverter, Current Source Inverter, PWM Control of Voltage Source Converter and applications.	**5**
5	INDUSTRIAL POWER SUPPLIES: Principle of operation of choppers. Step up, Step down and reversible choppers. Chopper control techniques, High frequency electronic ballast, Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck-boost converter. Uninterruptible Power Supply.	**6**
6	MOTOR CONTROL: Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods.	**5**
	Total	**28**

6EC4-02: Computer Network

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	students will have the knowledge and skills to: Understand and describe Queuing Theory
CO 2	students will have the knowledge and skills to: Understand and describe the layered protocol model
CO 3	Students will have the knowledge and skills to: network communication services for client/server and other application layouts.
CO 4	Students will have the knowledge and skills to: Describe, analyse and evaluate a number of datalink, network, and transport layer protocols.
CO 5	Students will have the knowledge and skills to: understanding of different components of computer networks, various protocols, modern technologies and their applications.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Queuing Theory- Pure birth, Pure death & Birth-death processes, Mathematical models for M/M/1, M/M/ □ , M/M/m, M/M/1/K and M/M/m/m queues. Little's formula.	**7**
3	Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic ail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts. Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical Multiplexing.	**9**
4	Transport layer: Connectionless transport - User Datagram Protocol, Connection oriented transport – Transmission Control Protocol, Remote Procedure Call. Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.	**9**
5	Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing	**7**
6	Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.Fundamental of SDN, Open flow.	**7**
	Total	**40**

6EC4-03: Fiber Optics Communications

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Analyze ray madal and propagation of light
CO 2	Analyze degradation in optical fibers
CO 3	Investigate dispersion and attenuation with OTDR and fabrication techniques
CO 4	Analyze various optical amplifiers switches and directional couplers
CO 5	Design a WDM system and analyze nonlinear effects in optical fiber communication

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Introduction to vector nature of light, propagation of light, propagation of light in a cylindricaldielectric rod, Ray model, wave model.Different types of optical fibers, Modal analysis of a step index fiber.	**8**
3	Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers andmeasurement techniques like OTDR	**7**
4	Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detectorresponsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.	**8**
5	Optical switches - coupled mode analysis of directional couplers, electro- optic switches.Optical amplifiers - EDFA, Raman amplifier.	**8**
6	WDM and DWDM systems. Principles of WDM networks.Nonlinear effects in fiber optic links. Concept of self-phase modulation, groupvelocity dispersion and solition based communication.	**8**
	Total	**40**

6EC4-04: Antennas and Propagation

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Able to analyze various Physical concepts of radiation in wired and loop and basic parameters of antenna.
CO 2	Able to analyze basic concept of aperture antenna, Reflector antenna and Broadband Antenna.
CO 3	Able to design and analyze rectangular and circular patch antennas.
CO 4	Able to design and analyze basics theory of the array of antenna and their Utility.
CO 5	Able to describe basics nature of electromagnetic wave and their propagation on ground, space, sky. Discuss recent trends of smart antenna and beam forming.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Fundamental Concepts-Physical concept of radiation, Radiation pattern, near andfar-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.	**7**
3	Radiation from Wires and Loops-Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.	**6**
4	Aperture and Reflector Antennas-Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.	**7**
5	Broadband Antennas-Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.	**5**
6	Micro strip Antennas-Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.	**6**
7	Antenna Arrays-Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkun off polynomial method, Woodward-Lawson method.	**5**
8	Basic Concepts of Smart Antennas-Concept and benefits of smart antennas, fixed weight beamforming basics, Adaptive beam forming.	**4**
9	Different modes of Radio Wave propagation used in current practice.	**1**
	Total	**42**

6EC4-05: Information Theory and Coding

Credit: 3 **Max. Marks: 150(IA: 30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Students will get the concepts of entropy & Source coding.
CO 2	Students will learn the various source coding schemes for data compaction.
CO 3	Students will get the concepts of linear block code and various operations on it.
CO 4	Students will be able to know cyclic code and its various concepts.
CO 5	Students will be able to know convolutional code and its various concepts.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**01**
2	Basics of information theory, entropy for discrete ensembles; Shannon's noiseless coding theorem; Encoding of discrete sources.	**15**
3	Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.	**15**
4	Techniques of coding and decoding; Huffman codes and uniquely detectable codes; Cyclic codes, convolutional arithmetic codes.	**10**
	Total	**41**

6EC5-11: Introduction to MEMS

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Students will get about objective,scope and outcome of the subject.
CO 2	Students will aware about Historical Background of MEMS and NEMS device development.
CO 3	Students will learn about physical and mechanical phenomenon like Hooks Law, Possion effect , energy containing during bending of beams etc.
CO 4	Students will learn about different types of sensors and actuators with thier application and manufcatoring process of different devices.
CO 5	Students will learn about micromaching techniques and difference between wet and dry etching also isotropic and anisotropic etching.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Introduction and Historical Background.	**1**
3	Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hookes's law, Poisson effect, Linear Thermal Expansion, Bending; Energy methods, Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems.	**14**
4	Scaling Effects. Micro/Nano Sensors, Actuators and Systems overview: Case studies. Review of Basic MEMS fabrication modules: Oxidation, Deposition Techniques, Lithography (LIGA), and Etching.	**14**
5	Micromachining: Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding.	**10**
	Total	**40**

7EC5-11: VLSI Design
(program elective-3)

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Students will get about objective,scope and outcome of the subject.
CO 2	Students will learn about MOSFET transistor, MOS fabrication and different model parameter of CMOS devices.
CO 3	Students will learn about pull up and pull down ratio of PMOS and NMOS and shematic and layout of differents logic devices with power and dely analysis.
CO 4	Students will learn about Zipper and NORA and Domino MOS devices and memory circuit design with CMOS
CO 5	Students will learn about different ECAD tool for designing of circuits and also learn about coding of devices using hardware langauge VHDL.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**01**
2	INTRODUCTION TO MOSFET- Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action, NMOS and CMOS fabrication. Aspects of threshold voltage, threshold voltage with body effect. Ids versus Vds relationship, channel length modulation. Transistor Trans-conductance gm. MOS transistor circuit Model, Model parameter (oxide and junction capacitor, channel resistance) variation with scaling and biasing. High order effects (i.e. sub threshold conduction, hot electron effect, narrow channel effect and punch through effect.	**12**
3	CMOS LOGIC CIRCUITS- NMOS inverter (resistive and active load), Pull up to Pull-down ratio($\beta p/\beta n$) for a NMOS Inverter and CMOS Inverter, determination of inverter parameter (VIL, VIH VOL VOH) and Noise Margin. Speed and power dissipation analysis of CMOS inverter. Combinational Logic, NAND Gate, NOR gate, XOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate (TG), estimation of Gate delays, Power dissipation and Transistor sizing. Basic physical design of simple Gates and Layout issues. Layout issues for CMOS inverter, Layout for NAND, NOR and Complex Logic gates, Layout of TG, Layout optimization using Eular path. DRC rules for layout and issues of interconnects, Latch up problem.	**11**
4	Dynamic CMOS circuits- Clocked CMOS (C2MOS) logic, DOMINO logic, NORA logic, NP(ZIPPER) logic, PE (pre-charge and Evaluation) Logic. Basic Memory circuits, SRAM and DRAM.	**08**
5	Physical Design- Introduction to ECAD tools for front and back end design of VLSI circuits. Custom /ASIC design, Design using FPGA and VHDL. VHDL Code for simple Logic gates, flip-flops, shift registers.	**08**
	Total	**40**

7PE6-60.2: Water Pollution Control Engineering

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Charaterise and understanf basic philosophy of design criteria for water treatment plant.
CO 2	Describe Physico-Chemical Treatment Methods and Biological Treatment Fundamentals
CO 3	Illustrate the Aerobic Suspended and Attached Growth Biological Treatment Processes
CO 4	Illustrate various types of Advanced water Treatment Processes like Membrane processes- reverse osmosis, ultrafiltration, nanofiltration and electrodialysis etc.
CO 5	Case studies will clear the design concept of the treatment plans for textile, tannery and other types of industries.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**01**
2	Introduction: Characterisation and monitoring of industrial and municipal waste water, recycling and reuse of wastewater. Basic philosophy and selection of water pollution treatment plants; Design criteria: hydraulic loading rate, organic loading rate, residence time, dilution rate.	**10**
3	Physico-Chemical Treatment Methods: Sedimentation, coagulation, flocculation, thickening, floatation. Biological Treatment Fundamentals: Microbial metabolism, bacterial growth kinetics; Biological nitrification, denitrification and phosphorus removal; Anerobic fermentation and aerobic treatment.	**10**
4	Aerobic Suspended and Attached Growth Biological Treatment Processes: Aerated lagoon, activated sludge systems, trickling filter, sequential batch reactor, fluidized bed bioreactors. Anaerobic Suspended and Attached Growth Biological Treatment Processes: UASB and hybrid UASB reactors, bio-towers.	**10**
5	Advanced Treatment Processes: Membrane processes- reverse osmosis, ultrafiltration, nanofiltration and electrodialysis; Wet air oxidation, adsorption and ion-exchange; Wet-land and root-zone treatment of industrial and municipal wastes; Design of sludge drying beds, thermal and biological processes for sludge and land fillings. Case Studies: Waste water treatment and disposal strategies in petroleum, petrochemical, fertilizer, distillery, pulp and paper industries.	**9**
	Total	**40**

8EC5-11: Artificial Intelligence and Expert Systems
(Program elective-4)

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Generalise the basic introduction to Artificial Intelligence.
CO 2	Deduce the knowledge representation & Logic.
CO 3	Interpret the knowledge organization in details
CO 4	Illustrate the different knowledge systems of artificial intelligence.
CO 5	Investigate the study of knowledge acquisition for Learning & processing.

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**01**
2	Introduction to Artificial Intelligence: Intelligent Agents, State Space Search, Uninformed Search, Informed Search, Two Players Games, Constraint Satisfaction Problems.	**08**
3	Knowledge Representation: Knowledge Representation And Logic, Interface in Propositional Logic, First Order Logic, Reasoning Using First Order Logic, Resolution in FOPL.	**07**
4	KNOWLEDGE ORGANIZATION: Rule based System, Semantic Net, Reasoning in Semantic Net Frames, Planning	**08**
5	KNOWLEDGE SYSTEMS: Rule Based Expert System, Reasoning with Uncertainty, Fuzzy Reasoning.	**08**
6	KNOWLEDGE ACQUISITION: Introduction to Learning, Rule Induction and Decision Trees, Learning Using neural Networks, Probabilistic Learning Natural Language Processing.	**08**
	Total	**40**

8TT6-60.2: Disaster Management

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcome:

Course Outcome	Details
CO 1	Students will Explain disaster management theory (cycle, phases, risk, crisis, emergency, disasters, resilience)
CO 2	Students will able to Compare hazards, disasters and associated natural phenomena and their interrelationships, causes and their effects -developing humanitarian Assistance before and after disaster
CO 3	Compare anthropogenic hazards, disasters and associated activities and their interrelationships of the subsystems -Green House Effect, Global warming, Causes and their effects and development of humanitarian assistance before and after disaster
CO 4	students will Apply knowledge about existing global frameworks and existing agreements and role of community in successful Disaster Risk Reduction
CO 5	

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**1**
2	Understanding Disasters and Hazards and related issues social and environmental. Risk and Vulnerability. Types of Disasters, their occurrence/ causes, impact and preventive measures:	**12**
3	Natural Disasters- Hydro-meteorological Based Disasters like Flood, Flash Flood, Cloud Burst, Drought, Cyclone, Forest Fires; Geological Based Disasters like Earthquake, Tsunami, Landslides, Volcanic Eruptions.	**12**
4	Man made Disasters: Textile Processing Industrial Hazards, Major Power Break Downs, Traffic Accidents, Fire Hazards.	**12**
5	Management roll in mitigating Disaster in Indian Textile Industries. Roll of production people in Disaster Management.	**3**
	Total	**40**