DEPARTMENT OF APPLIED PHYSICS

DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

Course of Study

B. Tech. (Engineering Physics)

Majors in Electronics and Minors in any one of the following

(Nanoscience and Technology/Photonics/Space and Atmospheric Sciences/

Plasma Science and Technology/Nuclear Engineering/Robotics and Intelligent Systems)

W.E.F. 2015-16 (2nd , 3rd, 4th year)

DRAFT COURSE OF STUDY
(Year wise) B.Tech Program

DEPARTMENT OF APPLIEDPHYSICS

BACHELOR OF TECHNOLOGY (ENGINEERING PHYSICS)

I Year: Odd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credit**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Group A														
1	MA101	Mathematics - I	ASC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics – I	ASC	4	3	0	2	3	0	15	15	30	40	-
3	AC101	Chemistry	ASC	4	3	0	2	3	0	15	15	30	40	-
4	ME101	Basic Mechanical Engineering	AEC	4	4	0	0	3	0	25	-	25	50	-
5	ME103	Workshop Practice	AEC	2	0	0	3	0	3	-	50	-	-	50
6	HU101	Communication Skills	HMC	3	3	0	0	3	0	25	-	25	50	-
	Total			**21**	16	1	7							
Group B														
1	MA101	Mathematics - I	ASC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics – I	ASC	4	3	0	2	3	0	15	15	30	40	-
3	EE101	Basic Electrical Engineering	AEC	4	3	0	2	3	0	15	15	30	40	-
4	CO101	Programming Fundamentals	AEC	4	3	0	2	3	0	15	15	30	40	-
5	ME105	Engineering Graphics	AEC	2	0	0	3	0	3	-	50	-	-	50
6	EN101	Introduction to Environmental Science	AEC	3	3	0	0	3	0	25	-	25	50	-
	Total			**21**	15	1	9							

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

I Year: Even Semester

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weights (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credit**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Group A														
1	MA102	Mathematics – II	ASC	4	3	1	0	3	0	25	-	25	50	-
2	AP102	Physics – II	ASC	4	3	0	2	3	0	15	15	30	40	-
3	EE102	Basic Electrical Engineering	AEC	4	3	0	2	3	0	15	15	30	40	-
4	CO102	Programming Fundamentals	AEC	4	3	0	2	3	0	15	15	30	40	-
5	ME102	Engineering Graphics	AEC	2	0	0	3	0	3	-	50	-	-	50
6	EN102	Introduction to Environmental Science	AEC	3	3	0	0	3	0	25	-	25	50	-
	Total			**21**	15	1	9							
Group B														
1	MA102	Mathematics – II	ASC	4	3	1	0	3	0	25	-	25	50	-
2	AP102	Physics – II	ASC	4	3	0	2	3	0	15	15	30	40	-
3	AC102	Chemistry	ASC	4	3	0	2	3	0	15	15	30	40	-
4	ME104	Basic Mechanical Engineering	AEC	4	4	0	0	3	0	25	-	25	50	-
5	ME106	Workshop Practice	AEC	2	0	0	3	0	3	-	50	-	-	50
6	HU102	Communication Skills	HMC	3	3	0	0	3	0	25	-	25	50	-
	Total			**21**	16	1	7							

II Year: Odd Semester)

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

S. No.	**Code**	**Title**	**Area**	**Cr**	**L**	**T**	**P**	**TH**	**PH**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
1.	ME251	Engineering Mechanics	AEC	4	3	1	0	3	0	25	0	25	50	-
2.	EP201	Introduction to Computing	DCC	4	3	0	2	3	0	15	15	30	40	-
3.	EP203	Mathematical Physics	DCC	4	3	1	0	3	0	25	0	25	50	-
4.	EP205	Classical and Quantum Mechanics	DCC	4	3	1	0	3	0	25	0	25	50	-
5.	EP207	Digital Electronics (Engineering Analysis and Design)	DCC	4	3	0	2	3	0	15	15	30	40	-

6.	MG201	Fundamentals of Management	HMC	3	3	0	0	3	0	25	0	25	50	-
		Total												

II Year: Even Semester

S. No.	Code	Title	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1.	EC262	Communication System	AEC	4	3	0	2	3	0	15	15	30	40	-
2.	EP202	Condensed Matter Physics	DCC	4	3	0	2	3	0	15	15	30	40	-
3.	EP204	Optics	DCC	4	3	0	2	3	0	15	15	30	40	-
4.	EP206	Microprocessor and Interfacing	DCC	4	3	0	2	3	0	15	15	30	40	-
5.	EP208	Computational Methods	DCC	4	3	1	0	3	0	25	0	25	50	-
6.	HU202	Engineering Economics	HMC	3	3	0	0			25	0	25	50	-
7.														

III Year: Odd Semester

S. No.	Code	Title	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1.	EP301	Semiconductor Devices	DCC	4	3	1	-	3	0	25	0	25	50	-
2.	EP303	Electromagnetic Theory, antennas and Propagation	DCC	4	3	0	2	3	0	15	15	30	40	-
3.	EP3xx	Departmental Elective Course- 1	DEC/GEC	4	3	0/1	2/0	3	0	15/25	15/-	30 /25	40/50	
4.	EP3xx	Departmental Elective Course- 2	DEC/GEC	4	3	0/1	2/0	3	0	15/25	15/-	30 /25	40/50	
5.	UExxx	University Elective Course	UEC	3	3	01	-	3	0	25	-	25	50	-
6.	HU301	Technical Communication	HMC	2	0	0	-	3	0	25	-	25	50	
		Total		21										

III Year: Even Semester

DRAFT SCHEME OF STUDY (Year 2, 3 & 4 B.Tech Program)

S. No.	Code	Title	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1.	EP302	Fiber Optics and Optical Communication	DCC	4	3	0	2	3	0	15	15	30	40	-
2.	EP304	Fabrication and Characterization of Nanostructures	DCC	4	3	1	0	3	0	25	0	25	50	-
3.	EP306	Microwave Engineering	DCC	4	3	0	2	3	0	15	15	30	40	-
4.	EP3xx	Departmental Elective Course- 3	DEC/GEC	4	3	0/1	2/0	3	0	15/25	15/-	30 /25	40/50	
5.	EP3xx	Departmental Elective Course- 4	DEC/GEC	4	3	0/1	2/0	3	0	15/25	15/-	30 /25	40/50	
6.	HU304	Profession Ethics & Human Values	HMC	2	2	0	-	3	0	25	-	25	50	
		Total		22										

IV Year: Odd Semester

S.No.	Code	Title	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1.	EP401	B.Tech. Project-I	DCC	4										
2.	EP403	Training Seminar	DCC	2										
3.	EP405	VLSI and FPGA design	DCC	4	3	0	2	3	0	15	15	30	40	-
4.	EP407	Mobile and Satellite communication	DCC	4	3	0	2	3	0	15	15	30	40	-
5.	EP4xx	Departmental Elective Course -5	DEC /GEC	4	3	0/1	2/0	3	0	15/25	15/-	30 /25	40/50	
6.	EP4xx	Departmental Elective Course-6 (Minor)	DEC /GEC	4	3	0/1	2/0	3	0	15/25	15/-	30 /25	40/50	-
		Total		22										

IV Year:Even Semester

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program)

S.No.	Code	Title	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1.	EP402	B.Tech. Project-II	DCC	8										
2.	EP404	Alternate Energy Storage and Conversion Devices	DCC	4	3	0	2	3	0	15	15	30	40	-
3.	EP4xx	Departmental Elective	DEC/GEC	4	3	1	0	3	0	25	0	25	50	-

		Course-7 (Minor)												
4.	EP4xx	Departmental Elective Course -8	DEC/GEC	4	3	1	0	3	0	25	0	25	50	-
				20										

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

List of Departmental Electives

S.No.	Elective Code	Title of Elective	Elective no.
1.	EP-305	Atomic and Molecular Physics	DEC-1,2
2.	EP-307	Biophysics	
3.	EP-309	Quantum Information and Computing	
4.	EP-311	Computer Networking	
5.	EP-308	Laser and Instrumentation	DEC-3,4
6.	EP-310	Medical Physics and Physiological measurements	
7.	EP-312	Fourier optics and holography	
8.	EP-314	Instrumentation and Control	
9.	EP-316	Cosmology and Astrophysics	
10.	EP-409	Information theory and coding	DEC-5,6
11.	EP-411	Advanced Simulation Techniques in Physics	
12.	EP-413	Continuum Mechanics	
13.	EP-415	Nano Science and Technology	
14.	EP- 417	Photonics	
15.	EP-419	Introduction to Automation and Motion Control	
16.	EP-421	Principles of Nuclear Engineering	
17.	EP-423	Space and Atmospheric Science-I	
18.	EP-425	Plasma Science and Technology-I	
19.	EP-406	Introduction to Spintronics	DEC-7,8
20.	EP-408	Integrated Optics	
21.	EP-410	Robotic Engineering	
22.	EP-412	Nuclear Materials for Engineering Applications	
23.	EP-414	Space and Atmospheric Science-II	
24.	EP-416	Plasma Science and Technology-II	
25.	EP-418	Digital Signal Processing	
26.	EP-420	Fuzzy Logic and Neural Networks	
27.	EP-422	Embedded Systems Design	

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

List of University Elective

S.No.	SUBJECT CODE	SUBJECTS
1.	CO351	Enterprise & Java Programming
2.	CO353	E-commerce & ERP
3.	CO355	Cryptography & Information Security
4.	CO357	Operating System
5.	CO359	Intellectual Property Rights & Cyber Laws
6.	CO361	Database Management System
7.	EC351	Mechatronics
8.	EC353	Computer Vision
9.	EC355	Embedded System
10.	EC 357	Digital Image Processing
11.	EC359	VLSI Design
12.	EE351	Power Electronic Systems
13.	EE353	Electrical Machines and Power Systems
14.	EE355	Instrumentation Systems
15.	EE357	Utilization of Electrical Energy
16.	EE359	Non-conventional Energy Systems
17.	EE361	Embedded Systems
18.	EN351	Environmental Pollution & E- Waste Management
19.	EN353	Occupational Health & Safety Management
20.	EN355	GIS & Remote Sensing
21.	EP351	Physics of Engineering Materials
22.	EP353	Nuclear Security
23.	HU351	Econometrics
24.	MA351	History Culture & Excitement of Mathematics
25.	ME351	Power Plant Engineering
26.	ME353	Renewable Sources of Energy
27.	ME355	Combustion Generated Pollution
28.	ME357	Thermal System
29.	ME359	Refrigeration & Air Conditioning
30.	ME361	Industrial Engineering
31.	ME363	Product Design & Simulation
32.	ME365	Computational fluid dynamics
33.	ME367	Finite Element Methods
34.	ME369	Total Life Cycle Management
35.	ME371	Value Engineering
36.	MG351	Fundamentals of Financial Accounting and Analysis
37.	MG353	Fundamentals of Marketing
38.	MG355	Human Resource Management
39.	MG357	Knowledge and Technology Management
40.	PE351	Advance Machining Process
41.	PE 353	Supply Chain Management
42.	PE355	Work Study Design
43.	PE357	Product Design & Simulation
44.	PE359	Total Life Cycle Management
45.	PE361	Total Quality Management
46.	PT361	High Performance Polymers
47.	PT363	Separation Technology
48.	PT365	Non-Conventional Energy
49.	PT367	Polymer Waste Management
50.	PT369	Nanotechnology in Polymers
51.	PT371	Applications of Polymer Blends and Composite
52.	IT 351	Artificial Intelligence and Machine Learning
53.	IT 353	Data Structures and Algorithms
54.	IT 355	Communication and Computing Technology
55.	IT 357	Internet and Web Programming
56.	IT 359	Java Programming

DRAFT SCHEME OF STUDY
(w.e.f. 2020) B. Tech Program

1. Subject Code: **ME- 251** Course Title: **Engineering Mechanics**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0

S. No.	Contents	Contact Hours
1.	**UNIT-I:** Rigid body static: Equivalent force system, Equation of equilibrium, Freebody diagram, Reaction, Static indeterminacy and partial constraints, Two and three forces systems	**04**
2.	**UNIT-1I:** Structures: 2D truss, Method of joints, Method of section, Frame, Beam, Types of loading and supports, Shear force and bending moment diagrams, Relation among load-shear for5ce-bending moment.	**08**
3.	**UNIT-III:** Friction: Dry friction(static and kinematics) , wedge friction, disc friction (thrust bearings) , belt friction, square threaded screws, journal bearings, (Axle friction) , Wheel friction, Rolling resistance	**08**
4.	**UNIT-IV:** Centre of gravity and Moment of Inertia : First and Second Moment of Area and Mass, radius of gyration, Parallel axis theorem, product of inertia, rotation of axes, and principal M.I. Thin plate, M.I. by direct method (by integration) , Composite bodies, Virtual work and energy method , Virtual displacement, principle of virtual work, Mechanical efficiency, Work of a force/ couple (springs etc) , Potential energy and equilibrium, stability	**08**
5\.	**UNIT-V:** Kinematics of Particles: Rectilinear motion, curvilinear motion, rectangular , normal, tangential , polar, cylindrical , spherical (co ordinates) , relative and constrained motion, space curvilinear motion	**08**
6.	**UNIT-VI:** Motion of rigid bodies: Translation, fixed axis rotation , general planner motion, work-energy, power, potential energy, impulse-momentum and associated conservation principles, Euler equation s of motion and its application	**06**
	Total	**42**

4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : AEC
8. Pre-requisite : Nil
9. Objective : To impart knowledge to the students about the distribution and balancing of forces acting on various objects, either in rest or in motions , and the methods of analyzing their effects.
10. Details of Course:

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

11..Suggested Books

S. No.	Name of Books/Authors	Year of Publication/ Reprint
1.	Engineering Mechanics by Dr. A.K.Tayal	2011
2.	Engineering Mechanics Statics and Dynamics By Dr. R.S. Khurmi	2012
3.	Engineering Mechanics By Dr. D.S.Kumar	2012

4.	Engineering Mechanics by Dr. S.S. Bhavikatti	1995

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

1. Subject Code: **EP-201** Course Title: **Introduction to Computing**
2. Contact Hours : L : 3 T : 0 P : 2
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 15 PRS : 15 MTE : 30 ETE : 40 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DCC
8. Pre-requisite : Nil
9. Objective : To familiarize the students with the widely used software Matlab so that they can develop the skill to solve the problem related to applied physics and engineering using Matlab

S. No.	Contents	Contact Hours
1.	**UNIT-I:** Introduction to Matlab: Advantages and disadvantages, Matlab environment: Command window, Figure window, Edit window, Variables and Arrays: Initializing variables in Matlab, Multidimensional arrays, Subarrays.	**04**
2.	**UNIT-1I:** Special values, Displaying output data, Data file, Scalar and array operations, Hierarchy of operations, Built-in-Matlab functions, Introduction to plotting: 2D and 3D plotting. Branching Statement and Program design: Introduction to top-Down design Technique, Use of pseudo code, Relational and logical operators, Branches, additional plotting features of Matlab	**08**
3.	**UNIT-III:** Loops: The while loop, for loop, details of loops operations, break and continue statement, nesting loops, Logical arrays and vectorization, User Defined Functions: Introduction to Matlab functions	**08**
4.	**UNIT-IV:** Variable passing in Matlab, Optional arguments, Sharing data using global memory, preserving data between calls to a function, function functions, Subfunction and private function.	**08**
5.	**UNIT-V:** Complex Data and Character Data: Complex data, String functions, Multidimensional arrays, Additional 2D plots, three dimensional plots, Input/Output Function: Text read function, load and save commands.	**08**
6.	**UNIT-VI:** An introduction to Matlab file processing, file opening and closing, Binary I/O functions, Formatted I/O functions, comparing binary and formatted functions, file positioning and Status functions, Numerical methods and developing the skills of writing the program	**06**
	Total	**42**

10. Details of Course:

S. No.	Name of Books/Authors	Year of Publication/ Reprint
1	MATLAB Programming for Engineers by Steven C. Chapra/ Cengage	2012
2	Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers/ Oxford	2010
3	Mastering MATLAB by Duane C. Hanselman/Pearson	2008
4	Computational Photonics: An Introduction with Matlab by M. S. Wartak Cambridge University Press	2013
5	Matlab: An Introduction with Applications by Amos Gilat/ Wiley India Private Limited	2007
6	A Concise Introduction to Matlab by W. J. Palm III McGraw Hill	2012

11..Suggested Books

PRINT VERSION OF STUDY (Year 2,3,4 B. Tech Program)

1. Subject Code: **EP-203** Course Title: **Mathematical Physics**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DCC
8. Pre-requisite: Basic knowledge of Vector analysis, Differentiation, Integration and ordinary differential equations (linear algebra)
9. Objective: to develop student's facility with certain mathematical techniques and to highlight applications of mathematical methods to physical systems.
10. Details of Course :

S.No.	Contents	Contact Hours
1.	**Review of Vector Analysis:** Scalar and vector fields, Triple Products, Vector Differentiations, divergence and curl, Vector and Volume Integrations, Applications of Greens, Gauss's and stokes theorem, Equation of continuity and its applications	8
2.	**Tensors:** Definition, Rank of a Tensor, Einstein's summation convention, Dummy and real index, Contravariant, Covariant and Mixed tensors, Addition, substraction, Contraction, Multiplication of tensors: inner and outer product, Quotient law, symmetric and anti-symmetric tensors-application of tensor theory to strain, thermal expansion, piezo-electricity and converse piezo-electric effect	10
3.	**Complex Variables:** Introduction, Functions of complex variables, limit, continuity, Analytic function, Cauchy-Reimann equations, Harmonic function, Singular points and classification, Cauchy theorem, Cauchy's integral formula, Taylor's and Laurent's series, Residues, Calculations of residues, Residue theorem-evaluation of definite integrals.	12
4.	**Partial Differentiatial Equations:** Introduction, Method of separation of variables- Solution of Laplace Equation in two dimensions- D'alemberts solution of the wave equation, Application of Laplace equation to two dimensional steady state of heat flow in a thin rectangular plate - application to the vibration of a rectangular membrane.	06
5.	**Numerical analysis:** Introduction to Numerical analysis, Forward and backward differences, Relation between the operators, Concept of Interpolation and Extrapolation, Newton-Gregory formula for forward and backward interpolation, Solution of ordinary differential equations of first order using Runge-Kutta Method.	06
	Total	**42**

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

11.Suggested Books

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Vector Analysis by M. R. Spiegel/Schaum's outline series, Tata McGraw Hill	1959
2.	Vector and Tensor analysis by Harry Lass, International Student edition/McGraw-Hill	1950
3.	Tensor Analysis-theory and applications by I.S. Sokolnikof/John Wiley & Sons, Inc	1951.

4.	Physical properties of crystals – their representation by Tensors and Matrices by J.F. Nye/Oxford Science Publications, Oxford University Press	1957
5.	Complex variables by M. J. Ablowitz, A.S. Fokas/2nd Edition/Cambridge University Press	2003
6.	Complex variable and applications by J.W. Brown and R.V. Churchill/6th ed., McGraw-Hill Higher Education	2009
7.	Advanced Engineering Mathematics by Erwin Kreyszig/10th Edition/John Wiley & Sons, INC.	2011
8.	Higher Engineering Mathematics by H.K. Dass, Er. R. Verma/ S. Chand & Company Ltd.	2012

1. Subject Code: **EP-205** Course Title: **Classical and Quantum Mechanics**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DCC
8. Pre-requisite : Basic knowledge of Modern Physics, Differentiation, Integration and Partial and Ordinary differential equations
9. Objective : * To develop familiarity with the physical concepts and facility with the mathematical methods of classical mechanics.
   * The student will be able to formulate and explain fundamental concepts of quantum mechanics, will learn to Solve Schrodinger equation to obtain eigenvectors and energies and describe the propagation of a particle in various potentials
10. Details of Course:

S.No.	Contents	Contact Hours
1.	Basic Principles of classical dynamics: Constraints of motion , generalised coordinates , D'Almbert Principle , The Lagrangian function, Lagrange's equations of motion: derivation and applications , Conservation theorems, Central forces: Definition and properties, The equations of motion, the equivalent one dimensional problem and classification of orbits.	8
2.	Hamilton's variational principle, The Hamiltonian (H), Hamilton's Canonical equations of motion, Physical Significance of H, Cyclic coordinates Derivation of Hamilton's equations from a variational principle, Applications of Hamilton's equations of motion	8
3.	Review of Schrödinger equation. Simple potential problems- penetration of a potential barrier, Dirac's Bra and ket notations, Operator Algebra : Hermitian, orthonormality, Superposition, Commutation Algebra, Ehrenfest Theorem, Angular momentum Operators and their algebra	8
4.	Approximation techniques in quantum mechanics : Stationery Perturbation Theory, Variational Method, Applications of variation method – (i) Ground state of hydrogen atom and (ii) helium atom.	8
5.	Wentzel Kramers Brillouin (WKB) approximation, Principle of WKB approximation, connection formulae for penetration of a barrier. Application of WKB Approximation method – (i) Transmission through a barrier (ii) Theory of alpha decay. Time dependent perturbation theory, perturbation theory for non degenerate case, a charged particle in an electromagnetic field	10

		Total	**42**

11.Suggested Books

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Classical Mechanics by H. Goldstein/Addison Wesley	2011
2.	Quantum Physics by S. Gasiorowicz/John Wiley , Asia	2003
3.	A textbook of Quantum Mechanics by P.W. Mathews and K. Venkatesan/Tata McGraw Hill	2nd Edition
4.	Quantum Mechanics by Schwabl/Narosa	2005
5.	Quantum Mechanics by L.I. Schiff/McGraw Hill	3rd Edition
6.	Quantum Mechanics by Merzbacher/John Wiley , Asia	3rd Edition
7.	Introduction to Quantum Mechanics by B.H. Bransden and C. J. Joachain/Longman	2nd Edition

1. Subject Code: EP 207 Course Title: Digital Electronics (Engineering Analysis and Design)
2. Contact Hours: L: 3 T: 0 P: 2
3. Examination Duration (Hrs.) Theory: 3 Practical: 0
4. Relative Weight: CWS: 15 PRS:15 MTE: 30 ETE: 40 PRE: 0
5. Credits: 4
6. Semester: ODD
7. Subject Area: DCC
8. Pre-requisite: NIL
9. Objective: To familiarize the student with the concept of Boolean algebra, logic gates, sequential and combinational circuits, counters and RAMs.
10. Details of Course:

S. No.	Contents	Contact Hours
1.	Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem-Principle of Duality	**3**
2.	Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm	**1**
3.	Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization, Don't care conditions	**3**
4.	Implementation of Logic Functions using gates, NAND–NAND and NOR-NOR implementations.	**2**
5.	BCD and XS3 Addition, Gray Codes	**1**
6.	1's complement and 2's complement subtraction.	**3**
7.	Introduction to the circuits for Arithmetic UNIT: Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor	**1**
8.	Parallel binary Adder/Subtractor –Serial Adder/Subtractor - BCD adder – 2's complement adder/subtractor	**3**
9.	Multiplexer, Demultiplexer, Decoder, Encoder,	**2**
10.	Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation — Edge triggering – Level Triggering	**2**
11.	Realization of one flip flop using other flip flops.	**2**
12.	Registers – shift registers - Bidirectional shift registers, serial and parallel configurations.	**1**
13.	Shift register counters – Ring counter, Johnson counter, Asynchronous Ripple or serial counter	**3**
14.	Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters	**1**
15.	Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and Circuit implementation	**2**
16.	Modulo–n counter,– Non-Sequential Counter Design using JK, D and T-design.	**2**

DRAFT SCHEME OF STUDY
For 3 4 B. Tech Program

17.	Introduction to VHDL-Behavioural Modeling, Dataflow Modeling, Structural Modeling, Application in Digital System Designs.	**2**
18.	Digital to analog converter: Binary Weighted Resistors, Analog to digital converter-Successive Approximation Method,	**1**
19.	Logic gates, DTL, TTL, ECL, I^2L, CMOS Gates and their parameters and comparisons.	**2**
20.	Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM	**2**
21.	RAM – RAM organization – Write operation – Read operation, memory expansion	**2**
22.	Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell	**1**
	Total	**42**

11.Suggested Books

S.No	Name of Books/ Authors	Year of Publication/ Reprint
1.	Thomas L. Floyd , Digital Fundamentals, Pearson Education Asia	1994
2.	Digital Integrated Electronics by H.Taub & D. Schilling(TMH).	1997
3.	Digital Principles and Application by Malvino & Leach (TMH).	1986
4.	Digital Electronics And Logic Design by M.Mano (EPI)	2004
5.	Switching And Finite Automata Theory by Z. Kohavi (TMH).	2009
6.	Modern Digital Electronics by R. P. Jain (TMH).	2009

1. Subject Code: **MG201** Course Title: **Fundamentals of Management**

2. Contact Hours: L: 3 T: 0 P: 0
3. Examination Duration (Hrs.): Theory: 3 Practical: 0

4. Relative Weight**:** CWS: 25 PRS: 0 MTE: 25 ETE: 50 PRE: 0

5. Credits: 3 6. Semester: III 7. Subject Area: HMC

8. Pre-requisite: NIL

9. Objective**:** The basic objective of this paper is to acquaint the students with the basic concepts of management necessary to deal with emerging business environment besides sensitizing them about societal challenges.

10. Details of Course:

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

S.No.	Detail Contents	Contact Hrs.
1	Definition of management, importance of management, management principals, managerial roles, managerial ethos, management vs administration, managerial functions, task and responsibilities, organizational structure, motivation: meaning, theories and techniques.	8
2	Concept of business environment, corporate social responsibility and corporate governance, managerial values and ethics.	8

3	Objectives and importance of financial management, basics of capital budgeting, cost of capital, emerging sources of funds for new projects, introduction to stock market.	9
4	Functions of marketing, marketing Vs sales, interface of marketing with other departments, customer life time value, new product development, unethical issues in marketing.	8
5	Introduction to knowledge management, knowledge society, knowledge economy, building knowledge assets, sources of knowledge, technology innovation process, E-governance: definition, objectives and significance; challenges in Indian context, Digital India programme.	9
	Total	**42**

11.Suggested Books

S. No.	Name of Books / Authors/ Publishers
1	Fundamental of Management, Stephen P. Robbins, David A. De Cenzo and Mary Coulter, Pearson Education, 2011(ISBN:9780273755869)
2	Financial Accounting, 4 ed, S.N. Maheshwari and S.K. Maheshwari, Vikas Pulication,2005 (ISBN: 8125918523)
3.	Management, James A F Stonner, Pearson Education,2010 (ISBN: 9788131707043)
4.	Marketing Management, 14th ed., Philip Kotler , Kevin Lane Keller, Abraham Koshy and MithileswarJha, Pearson Education, 2013 (ISBN: 9788131767160)
5	Knowledge Management in Organizations: A Critical Introduction, Donald Hislop, Oxford University Press,2013 ISBN: 9780199691937.

1. Subject Code: **EC-262** Course Title: **Communication system**
2. Contact Hours : L : 3 T : 0 P : 2
3. Examination Duration (Hrs.) : Theory : 3 Practical :
4. Relative Weight : CWS : 15 PRS : 15 MTE : 30 ETE : 40 PRE : 0
5. Credits : 4

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

6. Semester : Odd
7. Subject Area : AEC
8. Pre-requisite : Nil
9. Objective : To provide the in depth analysis of the concepts of the communication and modulation demodulation technique.
10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Introduction:** Block diagram of an electronic communication system, electromagnetic spectrum-band designations and applications, need for modulation. **Concept of Noise:** External noise, internal noise, signal to noise ratio, noise factor, noise temperature, Friss formula.	**08**
2.	**Amplitude modulation:** modulation index, frequency spectrum, generation of AM (balanced modulator), Amplitude Demodulation (diode detector), Other forms of AM: Double side band suppressed carrier, DSBSC generation (balanced modulator), Single side band suppressed carrier, SSBSC generation (filter method), SSB detection, Introduction to other forms of AM (Pilot Carrier Modulation, Vestigial Side Band modulation). **Angle modulation:** Frequency and Phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (direct methods), FM detector (slope detector, PLL).	**12**
3.	**Pulse Analog Modulation:** Sampling theorem, Errors in Sampling. Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM). Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM). Generation and detection of PAM, PWM, PPM. **Pulse Code Modulation:** Need for digital transmission, Quantizing, Uniform and Non-uniform Quantization, Quantization Noise, Companding, Coding, Decoding, Regeneration, Transmission noise and Bit Error Rate. Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation.	**12**
4.	**Digital Carrier Modulation Techniques:** Information capacity, Bit Rate, Baud Rate and M-ary coding. Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK). QPSK, Amplitude modulation, bandwidth efficiency, carrier recovery – squaring loop, Costas loop, DPSK.	**10**
	Total	**42**

11.Suggested Books

S.No.	Name of Books/ Authors	Year of publication/reprint
1.	Electronic Communications: Modulation and Transmission, by Robert J. Schoenbeck,	1991
2.	Electronic Communications by D.Roddy and J.Coolen	2008
3.	Electronic Communications by Kennedy	2011
4.	Digital and Analog Communication Systems by L.W.Couch	2001
5.	Communication Systems by Haykins	2006

DRAFT SCHEME OF STUDY (Year 3,3,4 B. Tech Program)

1.Subject code: **EP- 202** Course title: **Condensed Matter Physics**

2. Contact Hours: L:3 T:0 P:2

3. Examination Duration (Hrs): Theory: 3 Practical: 0

4. Relative Weight: CWS:15 PRS:15 MTE:30 ETE:40 PRE:0

5. Credits: 4

6. Semester: EVEN

7. Subject area: DCC

8. Pre-requisite: NIL

9. Objective: The course provides a valuable theoretical introduction, principles, techniques and an overview of the fundamental applications of the physics of solids.

10.Detail of Course:

S. No.	Contents	Contact Hours
1.	**Crystal Structure and bonding:**Introduction to crystal physics,Bravais lattices, Symmetry operations, Miller indices, Interplanar spacing, X-ray diffraction, Reciprocal lattice, Brillouin zones, Ionic bonding, Bond dissociation energy, Madelung constant of ionic crystals, Covalent, Metallic and Intermolecular bonds, Defects in crystals, Point and line defects.	**08**
2.	**Lattice Vibrations:** Lattice vibration and thermal properties: Einstein and Debye models; continuous solid; linear lattice; acoustic and optical modes; dispersion relation; attenuation; density of states; phonons and quantization; thermal conductivity of metals and insulators.	**05**
3.	**Free Electron Theory:** Free electron theory of metals; Electronic motion in a one and three dimensional potential well; Fermi energy, total energy, Density of states, Fermi-Dirac Distribution function, Wave equation in a periodic potential and Bloch theorem; Kronig-Penny model; band theory; Distinction between metal, semiconductor and insulators; band gap.	**05**
4.	**Dielectrics:** Polarization mechanism and types, dielectric constant, polarizabilities, Electronic, Ionic, Orientation/ dipolar polarizations under DC / AC field, Local Field, ClausiusMossoti equation, Behaviour of polarization under impulse, Dielectric loss, ferroelectric, piezoelectric and pyroelectric materials, application of dielectric materials.	**08**
5.	**Magnetism:** Magnetism: concept of magnetism, permeability and susceptibility. classification of dia-, para-, ferro-, antiferro and ferrimagnetism (Ferrites), Langevin theory of diamagnetism&paramagnetism, Weiss theory of paramagnetism, Ferromagnetic materials, Origin of internal field and exchange interaction, Domain theory, Bloch wall, Hysteresis, magnetic storage and surfaces, Application of magnetic materials, GMR.	**08**
6.	**Superconductivity:** Introduction and historical developments; Meissner effect and its contradiction to the Maxwell's equation; Effect of magnetic field, Type-I and Type-II superconductors, Critical parameters, Thermal properties, energy gap, Isotope effect, London equations, Penetration depth, Coherence length, BCS theory, Cooper pair, ground state, Josephson effect and tunnelling, Applications of superconductors.	**08**
	Total	**42**

11.Suggested Books

S. No.	Name of Books/ Authors	Year of publication/ Reprint
1.	Elementary Solid State Physics, by M. A. Omar/ Addison-Wesley	1975

2.	Introduction to Solid State Physics, by C. Kittel/ John Wiley	1996
3.	Solid State Physics, by A. J. Dekker/ Macmillan	1986
4.	Solid State Physics, N. W. Ashcroft and N. D. Mermin/ HBC Publication	1976
5.	Solid State Physics, by S. O. Pillai/ New Age International publication	2002
6.	Material Science and engineering: An Introduction By W. D. Callister Junior/ John Wiley & Sons, Inc	2003

1. Subject Code: **EP-204** Course Title: **Optics**
2. Contact Hours : L : 3 T : 0 P : 2
1. Examination Duration (Hrs.) : Theory : 3 Practical : 0
2. Relative Weight : CWS : 15 PRS : 15 MTE : 30 ETE : 40 PRE : 0
3. Credits : 4
4. Semester : EVEN
5. Subject Area : DCC

S. No.	Contents	Contact Hours
1.	Wave nature of light, Coherence: Spatial and temporal coherence, spectral resolution of a finite wave train, Optical Beats, Coherence time and line width via fourier analysis, Fourier transform spectroscopy.	**08**
2.	Theory of interference and interferometers: Interference of two monochromatic waves, two beam interference, multiple beam interference, Michelson interferometer, Fabry Perot interferometer	**08**
3.	Theory of diffraction, Fraunhofer diffraction, Single slit diffraction, two slit diffraction, N slit diffraction, diffraction by a circular aperture, diffraction by rectangular aperture, Resolving power of grating.	**06**
4.	Fresnel Diffraction , Fresnel Half period zones , zone plate, Gaussian beam propagation, Fresnel diffraction A Rigorous approach, Diffraction by straight edge, diffraction of a plane wave by along narrow slit and transition to the fraunhofer region	**10**
5.	Polarization , Production of Polarized light by different mechanisms	**05**
6.	Introduction to Lasers , Different types of lasers, Einstein Coefficients and Optical Amplification	**05**
	Total	**42**

6. Pre-requisite : Knowledge of the concepts of trigonometric operations and differential and integral calculus
7. Objective : To provide the in depth analysis of the concepts of the interference, diffraction and polarization and the applications related to them
10. Details of Course :

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

11.Suggested Books

S.No.	Name of Books/ Authors	Yearof Publication/ Reprint
1.	Optics by Hecht and Ganeshan/Pearson	2012
2.	Introduction to Optics by A.Ghatak/Tata McGraw Hill.	2012

3.	Principles of Optics by M. Born and E. Wolf, McMillan	
4.	Optical Physics by S. C. Lipson and H. Lipson/ Cambridge University Press	2010
5.	Introduction to optics by Pedrotti and Pedrotti/ Pearson Prentice Hall	2014
6.	Optoelectronics and Photonics by S.O. Kasap/Pearson	2010

1. Subject Code: EP 206 Course Title: Microprocessor and Interfacing
2. Contact Hours: L: 3 T: 0 P: 2
3. Examination Duration (Hrs.) Theory: 3 Practical: 0
4. Relative Weight: CWS: 15 PRS:15 MTE: 30 ETE: 40 PRE: 0
5. Credits: 4
6. Semester: EVEN
7. Subject Area: DCC
8. Pre-requisite: NIL

9.Objective: To familiarize the student with the concept of Microprocessors, memory organization, addressing modes and programing.

8. Details of Course:

S. No.	Contents	Contact Hours
1.	Basic Concepts of Microprocessors, Introduction to 8086 Microprocessor	**2**
2.	Internal architecture, Concept of address, data and control buses	**2**
3.	8086 hardware specifications: pin-outs and the pin-functions	**2**
4.	Real Mode Memory Addressing, Introduction to protected mode memory addressing	**2**
5.	Memory Address Space Organization.	**2**
6.	Programming model of 8086-general purpose registers, special purpose registers and segment registers	**2**
7.	Physical address generation, data addressing modes, program memory addressing modes, stack memory addressing modes	**3**
8.	data transfer instructions, arithmetic and logic instructions, flag control instructions, program control instructions	**2**
9.	Input/Output instructions	**3**
10.	Types of Interrupts, interrupt instructions, hardware interrupt interface, software interrupts, NMI interrupt	**2**
11.	Bus Cycle Timing Diagrams.	**3**
12.	Minimum and Maximum mode	**1**
13.	Subroutines: Call and Return Functions.	**1**
14.	Programmable Interrupt Controller – 8259	**2**
15.	Programmable Peripheral Interface (PPI) 8255	**2**
16.	Programmable Direct Memory Access (DMA) Controller - 8237/8257,	**2**
17.	Programmable Interval Timer - 8253.	**2**
18.	Introduction to PIC Microcontrollers, PIC microcontroller overview and features, PIC 16F877: ALU, CPU registers, pin diagram	**2**
19.	PIC reset actions, PIC oscillator connections, PIC memory organization,	**2**
20.	PIC 16F877 instructions, Addressing modes, I/O ports.	**1**

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21.	Interfacing applications of Microcontroller-interfacing of 7 segment display, LCD interfacing, ADC and DAC interfacing.	**2**
	Total	**42**

11.Suggested Books

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Y. Liu and G. A. Gibson, Microcomputer Systems: The 8086/8088 Family., Prentice Hall of India.	2nd Ed
2.	Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill.	
3.	Barry B. Brey, The Intel Microprocessors., Prentice Hall of India.	7th Ed
4.	Walter A. Treibel and Avtar Singh, The 8088 and 8086 Microprocessors, Prentice Hall of India.	
5.	Rafiquzzaman, Microprocessors, Prentice Hall of India.	
6.	A.K.Ray, K.M.Bhurchandi, Advanced Microprocessors and Peripherals, TMH.	Second edition
7.	Microcontroller and Embedded systems- M.A.Mazadi, J.G.Mazadi & R.D.McKinlay - Pearson PHI.	
8.	Embedded Design with Microcontrollers by Martin Bates.	

1. Subject Code: **EP-208** Course Title: **Computational Methods**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : EVEN
7. Subject Area : DCC
8. Pre-requisite : Nil
9. Objective : To familiarize the students with the numerical techniques to solve the problems related to science and engineering

10. Details of Course

S. No.	Contents	Contact Hours
1.	**UNIT I** *Errors in numerical calculations*: Introduction, Number and their accuracy, Errors and their analysis, Absolute, Relative, Percentage and Maximum probable error, Physical significance of errors, General error formula, Error in series approximation	**04**
2.	**UNIT II** *Solution of numerical algebraic and transcendental equation*: Roots of equations, Direct method and iteration method, Bisection method, Regula Falsi Method or Method of False position, Secant or Chord method, Newton-Raphson method, *Solution of simultaneous linear algebraic equation*: Gauss-elimination method, Gauss-Jordon elimination method, Power method, Jacobi method for finding eigen values, Rotation Matrix, Method of triangularization, Relaxation Method	**08**
3.	**UNIT III** *Interpolation:* Introduction, Errors in polynomial Interpolation, Finite differences, Detection of errors by use of difference tables, Differences of a polynomial, Interpolation with equally spaced data points: Newton's forward and backward formulae for interpolation, Central difference: Gauss forward, Gauss Backward, Stirling, Bessels, Everett's formula for interpolation, Interpolation with unequally data points: Lagrange's interpolation formula, Divided differences and their property, Newton Divided differences formula, *Curve fitting*: Introduction, Least square curve fitting procedures, fitting a straight line, nonlinear curve fitting, curve fitting by a sum of exponentials, Data fitting with cubic splines	**10**

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4.	**UNIT IV** *Numerical Differentiation and Integration*: Cubic Spline method, maximum and minimum values of a tabulated data, Numerical integration, Newton-cotes integration formulae, trapezoidal method, Simpson's 1/3-rule, Simpson's 3/8-rule, Boole's and Weddle's Rule, Romberg integration, , Euler-Maclaurin formula, Gaussian integration, Numerical double integration	**08**
5.	**UNIT V** *Numerical solution of ordinary differential equations*: Introduction, solution by Taylor's series, Picard's method of successive approximation methods, Euler's method, modified Euler's method, Runge-Kutta method, predictor-corrector method, solution of second order and simultaneous differential equations	**06**
6.	**UNIT VI** *Numerical solution of partial differential equation*: Introduction, Finite difference approximations to derivatives, Laplace's equation, Jacobi's method, Iterative method for solution of equation	**06**
	Total	**42**

11.Suggested Books

S. No.	Name of Books/Authors	Year of Publication/ Reprint
1	Numerical Methods for Engineers by Steven C. Chapra and Raymond P Canale/ McGraw-Hill International Editions	1998
2	An Introduction to Computational Physics by Tao Pang Cambridge University Press	2010
3	Numerical Methods for Engineers and Scientists by Amos Gilat/John Wiley & Sons	2008
4	Applied Numerical Analysis by Gerald and Wheatley	2003/Pearson
5	Numerical methods for Scientific and Engineering Computation by Jain Iyengar and Jain	2009/New Age

1. Subject Code: **HU202** Course Title: **Engineering Economics**

2. Contact Hours: L: 3 T: 0 P: 0
3. Examination Duration (Hrs.): Theory: 3 Practical: 0

4. Relative Weight**:** CWS: 25 PRS: 0 MTE: 25 ETE: 50 PRE: 0

5. Credits: 3

6. Semester: IV

7. Subject Area: DCC

8. Pre-requisite: NIL

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

9. Objective: To enable the students to understand the economic theories which may be applied to maximize return and economic environment in which they have to operate.

10. Details of Course:

S.No.	Contents	Contact Hours
1.	**Introduction:** Nature and significance of economics, Goods and Utility, Basic Concept of Demand and Supply, Elasticity of Demand- Price elasticity of Demand, Cross elasticity of Demand, Production - Production Function, Production Process and	10

	Factors of Production, Market – Introduction to Monopoly, Perfect Competition, Oligopoly and Monopolistic Competition, Cost Concepts- Opportunity Cost, Total Cost, Average Cost; Marginal Cost; Life Cycle cost, Sunk Cost; Preparation of Cost Sheet Profit Maximisation- numerical problem.	
2.	**Money- its evaluation and function, Bank- Commercial Bank and Central Bank and brief idea about function of banking system:**. Tax and Subsidy, Type of Tax- Direct and Indirect, Monetary and fiscal policy, Inflation and Business cycle, International trade, terms of Trade, Gain from International Trade, Free Trade vs. Protection, Dumping, Balance of Payment.	10
3.	**Role of Science, Engineering and Technology in Economic Development:** Seven salient Feature of the Indian Economy; Inclusive Growth; relevance for the Indian Economy; Globalisation & opening up of the Indian Economy; GDP- definition and Its measurement; How knowledge of engineering and technology may be used to improve life at slum; Green Revolution and White revolution. Reasons for their success and can we replicate them. Appropriate Technology & Sustainable Development. Entrepreneurship: Macro environment for promotion of entrepreneurship: How environment has changed after advent of IT and Globalisation.	12
4.	**Elementary Economic Analysis:** Interest formulas and their Applications; Calculations of economic equivalence, Bases for Comparison of Alternatives: Present Worth Method, Future worth method, Annual equivalent, Internal Rate of Return; Business Risk; Factors which should be taken care while deciding price of the product in the market.	10
	TOTAL	42

11.Suggested Books

S.No.	Name of Books / Authors/ Publishers
1.	G.J. Thuesen, & W.J. Fabrycky, Engineering Economy, Pearson Education, 2007, ISBN 013028128X
2.	William G. Sullivan, Elin M. Wicks, C. Patrick Koelling, Engineering Economy, Prentice Hall,(First Indian reprint). 2009, ISBN 0131486497
3.	Donald G. Newman, Jerome P. Lavelle & Ted G. Eschenbach, Engineering Economic Analysis, Oxford University Press, USA , 2004, ISBN 0195168070
4.	Seema Singh, Economics for Engineering Students, IK International Publishing House Pvt. Ltd, 2014, ISBN 8190777041

1. Subject Code: **EP-301** Course Title:**Semiconductor Devices**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DCC
8. Pre-requisite: Basic knowledge of physics, bonding, matter waves and schrodingers concept with mathematical physics back ground is pre-required for this course.
9. Objective: To impart the fundamental knowledge pertaining to semiconductor materials, various devices that can be fabricated using semiconductor devices along with their construction and working condiction.

DRAFT SCHEME OF STUDY (Year 3 & 4 B. Tech Program)

Applications various semiconductor devices in science and technology will be discussed.

10.Details of Course:

S.No.	Contents	Contact Hours
1.	**Introduction to the Quantum theory of solids:** Allowed and forbidden Energy bands, Electrical conduction in solids, density of state function, Semiconductor in Equilibrium: Equilibrium carrier concentration, Intrinsic semiconductor, Extrinsic semiconductor, Position of Fermi energy level.	10
2.	**Carrier transport phenomenon:** Random motion, Drift and diffusion, Graded Impurity distribution, Excess carriers: Injection level, Lifetime, Direct and indirect semiconductors, P-N Junction: Device structure and fabrication, Equilibrium picture, DC forward and reverse characteristics, Small-signal equivalent circuit, Generation – Recombination currents, Junction Breakdown, Tunnel diode.	12
3.	**Bipolar Junction Transistor:** History, Device structures and fabrication, Transistor action and amplification, low frequency, common- base current gain, Small-signal Equivalent circuit, Ebers-Moll model MOS Junction: C-V characteristics, threshold voltage, body effect Metal Oxide Field Effect Transistor: History, Device structures and fabrication, Common source DC characteristics.	10
4.	Small-signal equivalent circuit, Differences between a MOSFET and a BJT Junction FET and MESFET: Basic pn JEFT & MESFET operation, Device characteristics, Recent Developments: Hetero-junction FET, Hetro-junction bipolar transistor Optical Devices: Solar Cells, Photodectectors, LEDs.	10
	Total	**42**

11.Suggested Books

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Solid State Electronic Devices by Ben G. Streetman , Wiley Eastern	1970
2.	Physics of Semiconductor Devices by Michael Shur, Prentice Hall	1980
3.	Introduction to Solid State Physics by Kittel, Wiley	1986
4.	Integrated Electronics by Millman and Halkias, Wiley	1987
5.	Semiconductor Physics and Devices by Donald A.Neamen, Mc Graw Hill	1985

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

1. Subject Code: EP 303 Course Title: Electromagnetic Theory, antennas and Propagation
2. Contact Hours: L: 3 T: 0 P: 2
3. Examination Duration (Hrs.) Theory: 3 Practical: 0
4. Relative Weight: CWS: 15 PRS:15 MTE: 30 ETE: 40 PRE: 0
5. Credits: 4
6. Semester: ODD

7. Subject Area: DCC
8. Pre-requisite: NIL
9. Objective: To familiarize the student with the concept of propagation electromagnetic wave in a transmission line, Maxwell's equations, Antennas and wave propagation.
10. Details of Course:
    5th Semester

Sl. No.	Contents	Contact Hours
1.	Maxwell's equations, constitutive relations, wave equation, plane wave functions	04
2.	Rectangular waveguide, circular waveguide, dielectric slab waveguide	03
3.	Surface guided waves, characteristics of TM and TE modes, Impossibility of TEM waves in waveguides, wave impedances	04
4.	Characteristic impedance, excitation of modes, cutoff wavelength and phase velocity	02
5.	Cavities and power losses	02
6.	Transmission lines: transmission line equation in time and frequency domain, losses and dispersion, reflection from an unknown load; quarter wavelength, single stub and double stub matching; Smith Chart and its applications.	04
7.	distortion – distortion less transmission line – The telephone cable – Inductance loading of telephone cables. Input impedance of lossless lines – reflection on a line not terminated by Zo - Transfer impedance – reflection factor and reflection loss.	02
8.	Introduction to Antennas, Antenna parameters: Radiation intensity. Directive gain. Directivity. Power gain. Beam Width. Band Width. Gain and .radiation from simple dipole and aperture, horn antenna, microstrip antenna, parabolic disc antenna.	04
9..	Concept of antenna arrays, end fire and broadside arrays, Expression for electric field from two and three element arrays. Uniform linear array. Method of pattern multiplication. Binomial array.	03
10.	Use of method of images for antennas above ground.	02
11.	Basic types of propagation; ground wave, space wave and sky wave propagation. Sky wave propagation: Structure of the ionosphere	02
12.	Effective dielectric constant of ionized region. Mechanism of refraction. Refractive index. Critical frequency. Skip distance. Maximum usable frequency. Fading and Diversity reception.	03
13.	Space wave propagation: Reflection from ground for vertically and horizontally polarized waves. Reflection characteristics of earth. Resultant of direct and reflected ray at the receiver.	04
14.	Duct propagation. Ground wave propagation: Attenuation characteristics for ground wave propagation. Calculation of field strength at a distance.	03
	Total	42

11.Suggested Books:

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Advanced Engineering and Electromagnetics By C.A.Balanis.	2012
2.	Antennas and Wave Propagation by J.D.Kraus, R.J.Marhefka and A.S.Khan	2014
3.	Electromagnetics for Engineers by S.E.Schwarz	1990
4.	Introduction to Electrodynamics by David J.Griffiths	2012
5.	Electromagnetic Waves and Radiating Systems by E.C. Jordan & K.G. Balmain	1964

DRAFT SCHEME OF STUDY
Year 2 & 3 of B. Tech Program

1. Subject Code: **HU 301** Course Title: **Technical Communication**
2 Contact Hours: L: 2 T: 0 P: 0
3. Examination Duration (ETE) (Hrs.): Theory 03 Practical 0
4. Relative Weightage: CWS 25 PRS 0 MTE 25 ETE 50 PR 0
5. Credits: 2
6. Semester: V/ VI
7. Subject Area: HMC
8. Pre-requisite: Nil
9. Objectives: To train students for business communication to enhance employability skills with special emphasis on placement interviews and public speaking.

10. Details of Course:

Sl. No.	Contents	Contact Hours
1.	**English for Professional Purposes:** **A.** Technical Communication- Methods, Strategies and Skills **B.** Communication in Global Contexts- Social, Cultural, Political and Technical, especially in formal set up	1 2
2.	**Communication at the Workplace: Oral and Written:** **A. Written Communication**- Letters, Orders (Sale/Purchase) Report Writing, Technical proposals Resume, SOP, Memo, Notice, Agenda, Minutes, Note Taking/Making, **B. Oral Communication**: Seminars, Conferences, Meetings, Office Etiquettes/ Netiquettes, Presenting Written Material Negotiation, Demonstration, Group Discussion, Interview	6 6
3.	**Group Discussion** and **Report Writing:** i) Group Discussion (Continous assessment through the semester) ii) Minor Report Writing(to be submitted before Mid- Semester Examination) iii) Major Report writing (To be submitted before End Semester Examination)	13
	Total	28

11.Suggested Books:

Sl.No.	Name of Books, Authors, Publishers	Year of Publication/Reprint
1	Technical Communication: Principles and Practice Raman, Meenakshi and Sangeeta Sharma, Oxford University Press, ISBN-13: 978-0-19-806529-6	2011, Reprinted 2014
2	Writing to Get Results, (3rd Ed) Blicq, Ron S., Lisa A. Moretto, John Wiley and Sons, Inc. ISBN 0-7803-6020-6	2001
3	Effective Technical Communication: A Guide for Scientists and Engineers , Mitra, Barun K. OUP: Delhi ISBN-13: 978-0-19-568291-5	2006
4	Personality Development and Soft Skills, Mitra, Barun K. New Delhi: Oxford University Press. ISBN-9780198060017	2014
5	The Essence of Effective Communication**,** Ludlow, Ron and Fergus Panton. Prentice Hall: PHI. ISBN-81-203-0909-X	1996

DRAFT SCHEME OF STUDY
Year 2015 B.Tech Program

6	Advanced Technical Communication, Gupta, Ruby. Foundation Books, CUP. ISBN 978-81-7596-733-5	2011
8	Soft Skills: Enhancing Employability, Rao, M.S. Connecting Campus with Corporate ISBN: 978-93-80578-38-5	2011
9	Developing Communication Skills (2nd Ed), Mohan, Krishna and Meera Banerji, Macmillan Publishers India Ltd. ISBN 13: 978=0230-63843-3	2009

1. Subject Code: **EP-302** Course Title: Fiber **Optics and Optical Communication**
2. Contact Hours : L : 3 T : 0 P : 2
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 15 PRS : 15 MTE : 30 ETE : 40 PRE : 0
5. Credits : 4
6. Semester : EVEN
7. Subject Area : DCC
8. Pre-requisite : Knowledge of the basic concepts of optics . Knowledge of the partial differential equations, their solutions & special functions
9. Objective : To provide the in concepts fiber optics and optical communication systems
10. Details of Course :

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Fibre Optic communication by Keiser	2009 / McGraw Hill.
2.	Optical communication systems by J.Gowar	Prentice Hall India
3.	Integrated optics by T. Tamir	Springer-Verlag
4.	Optical fibres telecommunication by S.E. Miller & A.G. Chynoweth	2010/ Academic Press
5.	Nonlinear Fiber Optics by Govind Aggarwal	2013/ Elsevier
6.	Optoelectronics and Photonics by S.O. Kasap	2010/Pearson
7.	Fiber Optics Handbook for engineers and scientists by F.C. Allard	2009/ McGraw Hill

DRAFT SCHEME OF STUDY (Year 2015) B.Tech Program

11.Suggested Books:

S. No.	Contents	Contact Hours
1.	Introduction and importance of Fiber Optics Technology. Ray analysis of optical fiber: Propagation mechanism of rays in an optical fiber, Meridional rays, Skew rays, Fiber numerical aperture	**04**
2.	Electromagnetic mode theory for optical propagation, Modal analysis of planar step index waveguide	**08**
3.	Mode theory for circular waveguides: step index fibers Propagation characteristics of step index fibers, graded index fibers Fabrication of optical fibers	**10**
4.	Signal degradation on optical fiber due to dispersion and attenuation, Pulse dispersion in graded index optical fibers, Material dispersion, Waveguide dispersion and design considerations	**08**
5.	Optical Sources : LEDs and Laser diodes Detectors for optical fiber communication	**06**
6.	Optical fiber amplifiers – EDFA: Gain spectrum and gain band width, EDFAs for WDM transmission.	**06**
	Total	**42**

1. Subject code: **EP- 304** Course title: **Fabrication and Characterization of Nanostructures**
2. Contact Hours: L: 3 T: 1 P: 0
3. Examination Duration (Hrs): Theory: 3 Practical: 0
4. Relative Weight: CWS: 25, PRS:--, MTE: 25, ETE: 50, PRE: --
5. Credits: 4
6. Semester: EVEN
7. Subject area: DCC
8. Pre-requisite: Basic knowledge of crystal structure and physics of solids
9. Objective: The main goal of this subject is to provide basic understanding of Fabrication and Characterization of nanostructures in the fascinating world of "Nanotechnology" and implementing it for various applications

10. Detail of Course:

S. No.	Contents	Contact Hours
1.	X-ray Diffraction (XRD), Bragg's law, Application in crystallography, Diffractogram, Paricle size determination using XRD, **Probe Techniques:** Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), Scanning Tunneling Microscopy (STM),	**08**

	Transmission Electron Microscopy (TEM), High Resolution Transmission Electron Microscopy (HRTEM)	
2.	Infrared Spectroscopy, Raman Spectroscopy, Electronic spectroscopy for atoms and molecules, Spin Resonance Spectroscopy, Nuclear Magnetic Resonance spectroscopy (NMR), Deep level transient spectroscopy (DLTS), Kelvin-probe measurements, Nanoscale current-voltage (I-V) investigations, Capacitance-Voltage (C-V) Relationships	**08**
3.	Fundamental concepts of Bottom-Up and Top-Down approaches, Self assembly and Self organization, Lithographic Process and its Limitations, Nonlithographic Techniques	**04**
4.	Growth Techniques of Nanomaterials: Plasma Arc discharge, Sputtering, Evaporation: Thermal, E-beam evaporation, Laser ablation, Chemical Vapor Deposition (CVD), Plasma enhanced CVD, Thermal CVD, Vapor phase growth, Laser assisted Thermal CVD, Pulsed Laser Deposition, Molecular Beam Epitaxy (MBE), Sol-Gel Technique, Electrodeposition, Other Processes: Ball Milling, Chemical Bath Deposition (CBD), Ion Beam Deposition (IBD), Ion Implantation	**12**
5.	Fabrication of nanoparticles, Synthesis of colloidal particles, Synthesis of nanogold particles, Synthesis of nanocomposites and nanostructures, Fabrication of quantum dots, Nanowires, Nanorods, Nanointermetallics, Controlled colloidal synthesis, Synthesis of polymer supported clusters and polymeric nanofibers, Nanolithography, Electron beam and focused ion beam lithographies, Carbon Nanotubes (CNT's): Single Walled, Multi-walled	**10**
	Total	**42**

11.Suggested Books:

S. No.	Name of Books/ Authors	Year of publication/ Reprint
1.	Nanotechnology by Gregory Timp	1999/Springer
2.	Introduction to Nanoscience & Technology by K.K. Chattopadhyay, A.N. Banerjee	2012/PHI Learning Pvt. Ltd.
3.	Nanolithography: A borderland between STM, EB, IB and X-ray lithographies- M. Gentili et al	1994/Springer
4.	Nanostructures & Nano Materials by Guozhong Cao, Ying Wang	2011/World Scientific
5.	Infrared Spectroscopy: Fundamentals and applications by Barbara Stuart	2004/Wiley

1. Subject Code: EP 306 Course Title: Microwave Engineering
2. Contact Hours: L: 3 T: 0 P: 2
3. Examination Duration (Hrs.) Theory: 3 Practical: 0
4. Relative Weight: CWS: 15 PRS:15 MTE: 30 ETE: 40 PRE: 0
5. Credits: 4
6. Semester: EVEN
7. Subject Area: DCC
8. Pre-requisite: NIL
9. Objective: To familiarize the student with the concept of transmission line, microwave tubes and devices.
10. Details of Course:

DRAFT SCHEME OF STUDY
(Year 2, 3 & 4 B. Tech Program)

S. No.	Contents	Contact Hours
1.	Introduction and review of transmission lines.	**2**
2.	Applications of Microwaves. Waveguide components and applications- Coupling Mechanisms – Probe, Loop, Aperture types.	**2**
3.	Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads	**2**
4.	Waveguide Attenuators –Resistive Card, Rotary Vane types; Waveguide Phase Shifters– Dielectric, Rotary Vane types.	**2**
5.	Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee, Hybrid Ring	**2**
6.	Directional Couplers – 2 Hole, Bethe Hole types	**2**
7.	Ferrites– Composition and Characteristics, Faraday Rotation; Ferrite Components – Gyrator, Isolator, Circulator.	**2**
8.	Scattering Matrix– Significance, Formulation and Properties. S Matrix Calculations for – 2 port Junction, E plane and H plane Tees, Magic Tee, Directional Coupler, Circulator and Isolator.	**2**
9.	MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes	**4**
10.	Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes.	**2**
11.	Limitations and Losses of conventional tubes at microwave frequencies	**2**
12.	Microwave tubes – O type and M type classifications. O-type tubes	**2**
13.	2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency.	**4**
14.	Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching.	**2**
15.	Significance, Types and Characteristics of SlowWave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Nature of the four Propagation Constants, Gain Considerations.	**3**
16.	M-type Tubes- Introduction, Cross-field effects, Magnetrons	**2**
17.	Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron	**2**
18.	Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation.	**3**
	Total	**42**

11.Suggested Books:

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,	1994.
2.	2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi,	2004.
3.	3. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley,	2nd Edition, 2002.
4.	4. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd.,	1995.
5.	5. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI,	1999.
6.	6. Electronic and Radio Engineering – F.E. Terman, McGraw- Hill, 4th ed.,	1955.

DRAFT SUBJECT STUDY
For B.Tech Program

1. Subject Code: **HU 304** Course Title: **Professional Ethics and Human Values**
2 Contact Hours: L: 2 T: 0 P: 0

3. Examination Duration (ETE) (Hrs.): Theory 03 Practical 0

4. Relative Weightage: CWS 25 PRS 0 MTE 25 ETE 50 PR 0

5. Credits: 2
6. Semester: V/ VI
7. Subject Area: HMC
8. Pre-requisite: Nil
9. Objective Processes: To make students aware of the ethics and codes of conduct required by Engineers and Professionals.
10. Details of Course:

10. **Details of the Course**:

Sl No.	**Name of Books, Authors, Publishers**	**Contact Hours**
1	**Human Values and Ethics:** Morals, Values, Ethics and Integrity, Need for Value Education for Engineers, Happiness, Prosperity, Harmony.	6
2	**Code of Ethics and Professionalism:** Professionalism and the Code of Ethics, Technical Education, Human Values and Coexistence, Universal Human Order, Natural acceptance.	6
3	**Professional Ethics and Technology :**Science, Technology and Professional EthicsEngineering Ethics, Environmental Ethics, Safety, Responsibility and Rights	8
4	**Case Studies:** Holistic Technologies, Eco-friendly production systems, The role of responsible engineers and technologists, Global Issues concerning Engineers	8
	Total	28

11.Suggested Books:

Sl.No.	**Name of Books, Authors, Publishers**	**Year of Publication/Reprint**
1.	Professional Ethics, Subramanian, R, Oxford University Press, ISBN13: 978-0-19-808634-5	2011
2.	Professional Ethics and Human Values,Govindarajan, M. S. Natarajan, V.S. Senthilkumar PHI, **ISBN: 978-81-203-4816-5**	2013
3.	Constitution of India and Professional Ethics, Reddy, G.B. and Mohd. Suhaib, IK International Publishing House. ISBN: 81-89866-01-X	2006
4.	Introduction to Engineering Ethics (2nd Ed.) Martin, Mike W. and Roland Schingzinger McGraw-Hill ISBN 978-0-07-248311-6	2010
5.	Gopi, S., "Global Positioning System: Principles and Applications", Tata McGraw Hill. (ISBN 0-07-7691528-1)	2005

DRAFT SCHEME OF STUDY
(Year 2,3,4 B.Tech Program)

1. Subject Code: **EP401** Course Title: **B.Tech Project-I**

2. Contact Hours: L:0 T:0 P:0
3. Examination Duration (Hrs.): Theory: 0 Practical: 0

4. Relative Weight**:** CWS: 0 PRS: 0 MTE: 0 ETE: 0 PRE: 0

5. Credits: 4

6. Semester: VII

7. Subject Area: DCC

8. Pre-requisite: NIL

9. Objective: To familiarize the students to work in group and develop an independent understanding of engineering and analysis of engineering systems. He should also be able to write and present the work done during the course.

1. Subject Code: **EP403** Course Title: **Training Seminar**

2. Contact Hours: L: 0 T:0 P:0
3. Examination Duration (Hrs.): Theory: 0 Practical: 0

4. Relative Weight**:** CWS: 0 PRS: 0 MTE: 0 ETE: 0 PRE: 0

5. Credits: 2

6. Semester: VII

7. Subject Area: DCC

8. Pre-requisite: NIL

9. Objective: To familiarize the students to work in industry and working culture of the industrial system. He should also be able to write and present the work done during the course.

1. Subject Code: EP 405 Course Title: VLSI and FPGA Design
2. Contact Hours: L: 3 T: 0 P: 2
3. Examination Duration (Hrs.) Theory: 3 Practical: 0
4. Relative Weight: CWS: 15 PRS:15 MTE: 30 ETE: 40 PRE: 0
5. Credits: 4
6. Semester: ODD
7. Subject Area: DCC
8. Pre-requisite: NIL
9. Objective: To familiarize the student with the concept of MOSFET, VLSI circuits, RAM, ROM and implementation of FPGA.
10. Details of Course:

S. No.	Contents	Contact Hours
1.	Enhancement mode & Depletion mode MOSFETs	**2**
2.	Basic MOS inverter design, transfer characteristics, logic threshold	**1**
3.	NAND \ NOR logic	**1**
4.	Transit time and inverter time delay, CMOS inverter	**2**
5.	Inverting and non-inverting type super buffers, noise margins.	**2**
6.	MOS design rules: Lamda based design rules and MOS layers.	**2**
7.	Stick diagrams, NMOS design layout diagrams	**1**
8.	Scaling of MOS Circuits. Functional limitations to scaling	**2**
9.	Failure mechanism in VLSI, Fault finding in VLSI chips.	**2**
10.	Packaging of VLSI devices, packaging types. Packaging design consideration	**2**
11.	VLSI assembly technology and fabrication technologies.	**2**
12.	Static Random Access Memories (SRAMs), SRAM Cell Structures, MOS SRAM Architecture	**3**

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

13.	MOS SRAM Cell and Peripheral Circuit, Bipolar SRAM, SOl	**2**
14.	Application Specific SRAMs; DRAMs, MOS DRAM Cell	**2**
15.	Failures in DRAM, Advanced DRAM Design and Architecture	**2**
16.	Bipolar & CMOS PROM, EEPROMs, Floating Gate EPROM Cell	**2**
17.	Nonvolatile SRAM, Flash Memories	**2**
18.	Introduction to ASICs and FPGAs, Fundamentals in digital IC design	**2**
19.	FPGA & CPLD Architectures, FPGA Programming Technologies	**2**
20.	FPGA Logic Cell Structures	**2**
21.	FPGA Implementation of Combinational Circuits	**2**
22.	FPGA Sequential Circuits	**2**
	Total	**42**

11.Suggested Books

S. No	Name of Books/Authors	Yearof publication/ reprint
1	Dougles A. Pucknell and kamran Eshraghian, "Basic VLSI Systems and Circuits Prentice Hall of India Pvt. Ltd.	1995
2	Wayne Wolf, "Modern VLSI Design, 2nd Edition Prentice Hall of India Pvt. Ltd.	2002
3	Ashok K.Sharma, " Semiconductor Memories Technology	2002
4	Testing and Reliability Prentice Hall of India Pvt. Ltd.	2008
5	Wen C. Lin, "Handbook of Digital System Design	1990

1. Subject Code: EP 407 Course Title: Mobile and Satellite Communication
2. Contact Hours: L: 3 T: 0 P: 2
3. Examination Duration (Hrs.) Theory: 3 Practical: 0
4. Relative Weight: CWS: 15 PRS:15 MTE: 30 ETE: 40 PRE: 0
5. Credits: 4
6. Semester: ODD
7. Subject Area: DCC
8. Pre-requisite: NIL
9. Objective: To familiarize the student with the concept of Modulation techniques and satellite system.

10. Details of Course**:**

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

11.Suggested Books

S. No.	Contents	Contact Hours
1.	Introduction to wireless communication: Evolution of mobile communications, mobile radio systems- Examples, trends in cellular radio and personal communications. Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems, Free space propagation model, reflection,diffraction, scattering.	10
2.	Modulation Techniques: Minimum Shift Keying, Gauss ion MSK, M-ary QAM, M-ary FSK, Orthogonal Frequency Division Multiplexing, Performance of Digital Modulation in Slow-Flat Fading Channels and Frequency Selective Mobile Channels.Coding: Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD.	10
3.	Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Synchronous & Statistical TDM, North American digital multiplexing hierarchy, European TDM, Spread spectrum: Frequency Hopping & Direct Sequence spread spectrum. Terminal handling & polling. Switched Communication Networks: Circuit, Message, Packet & Hybrid Switching, Softswitch Architecture with their comparative study, X.25, ISDN. Capacity of Cellular CDMA and SDMA.Second Generation and Third Generation Wireless Networks and Standards, WLL, Blue tooth. AMPS, GSM, IS-95 and DECT	10
4.	Introduction to satellite communication, Satellite Systems, Orbits and constellations: GEO, MEO and LEO, Satellite space segment, Propagation and satellite links, Free-space loss, Attenuation, polarization, fading and scintillation, Link budget analysis, Satellite Communication Techniques, FEC and ARQ, Satellite Communications Systems andApplications- INTELSAT systems, VSAT networks, GPS, GEO, MEO and LEO mobile communications, INMARSAT systems,Iridium, Globalstar, Odyssey	12
	Total	42

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	T.S.Rappaport, Wireless Communications: Principles and Practice, Second Edition Pearson Education/ Prentice Hall of India,	Third Indian Reprint 2003
2.	R. Blake, Wireless Communication Technology Thomson Delmar,	2003
3.	W.C.Y.Lee, Mobile Communications Engineering: Theory and applications, Second Edition McGraw-Hill International	1998

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

1. Subject Code: **EP-402** Course Title: **B.Tech project-II**

2. Contact Hours: L:0 T:0 P:0
3. Examination Duration (Hrs.): Theory:0 Practical: 0

4. Relative Weight**:** CWS: 0 PRS: 0 MTE: 0 ETE:0 PRE: 0

5. Credits: 8

6. Semester: VIII

7. Subject Area: DCC

8. Pre-requisite: NIL

9. Objective: To familiarize the students to work in group and develop an independent understanding of engineering and analysis of engineering systems. He should also be able to write and present the work done during the course.

1. Subject code: **EP- 404** Course title: **Alternative Energy Storage and Conversion Devices**
2. Contact Hours: L:3 T:0 P:2

3. Examination Duration (Hrs): Theory: 3 Practical: 0

4. Relative Weight: CWS:15PRS:15 MTE:30 ETE:40 PRE:0

5. Credits: 4

6. Semester: EVEN

7. Subject area: Renewable energy

8. Pre-requisite: NIL

9. Objective: The student will be able to understand about the various renewable energy resources their primary requirement and importance in various applications.

10. Detail of Course:

S. No.	Contents	Contact Hours
1.	**Introduction to Renewable energy resources:** Introduction to world energy scenario, solar radiation, Solar Geometry, radiation models; Solar Thermal, thermal efficiency, concentrators, evacuators, introduction to thermal systems (flat plate collector), solar architecture.	**7**
2.	**Photo voltaic (PV) technology:** Present status, solar cells technologies, Introduction to semiconductor physics, doping, P-N junction, Solar cell and its I-V characteristics, PV systems components, applications.	**5**
3.	**Wind Energy:** Wind speed and power relation, power extracted from wind, wind distribution and wind speed measurement by anemometer, Wind power systems: system components, Types of wind turbines, wind turbine efficiencies, Betz limit.	**7**
4.	**Bio-Energy:** Biomass and its uses, Classification of biomass, wood composition, Characteristics of biomass, Biomass conversion processes, Gasification and combustion of biomass, Gasifiers, pyrolysis,biogas, bio-fuel, bio-diesel, ethanol production.	**8**
5.	**Energy storage & Conversion systems:** introduction to battery systems, rechargeable batteries: lithium - ion, Pb-acid, Ni-Metal hydride batteries, fuel cells; classification of fuel cells, AFC, SOFC, PAFC etc. their construction and working, Efficiency of fuel cells, super capacitors.	**8**

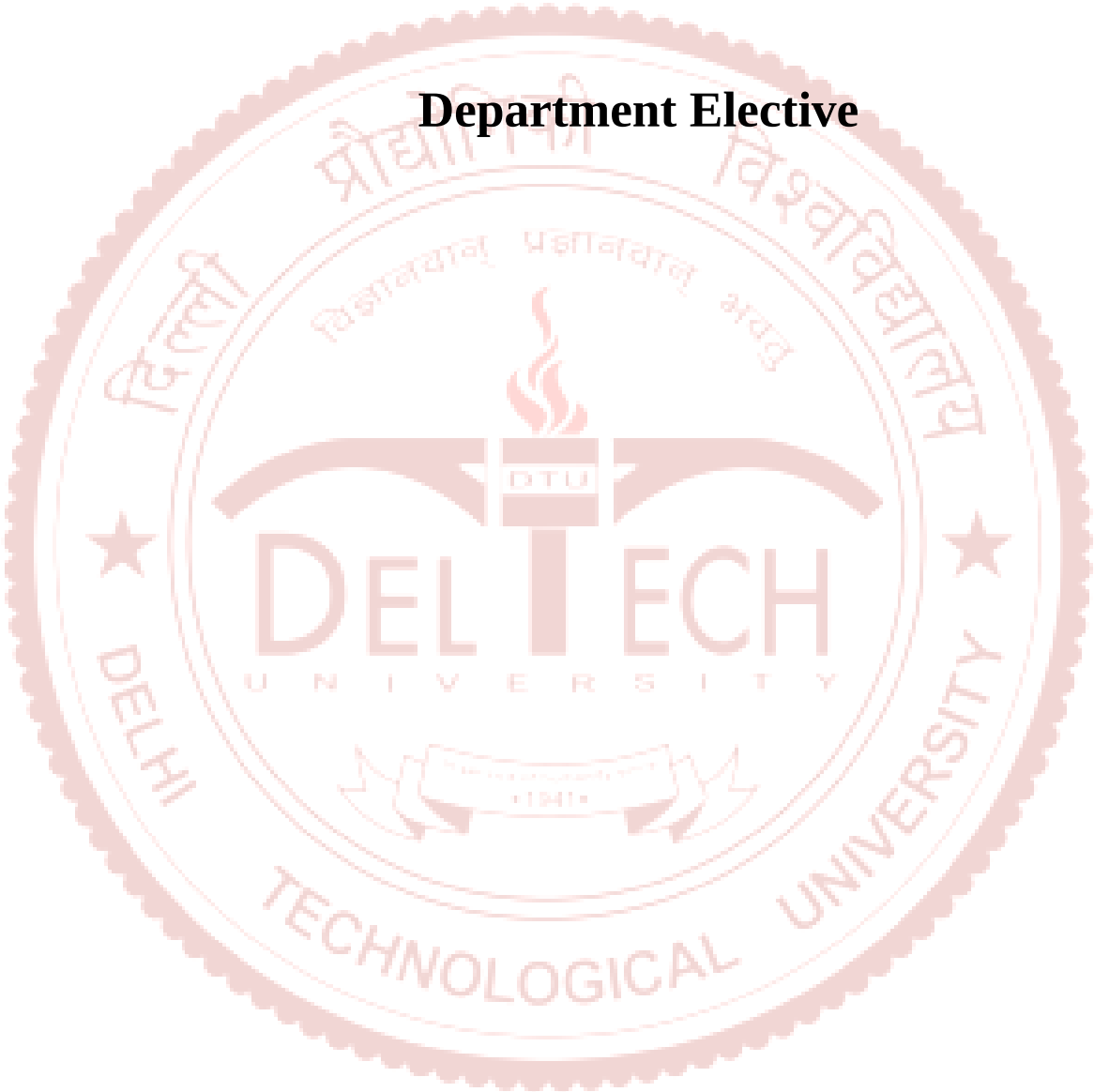
6.	**Hydel&Tidel Energy:** Types of Hydro Power Plants, Hydro Power Estimates – Hydrological analysis, Effect of storage, power canal, Hydraulic Turbines – Types of turbines, their parts and working, Governing and controls of turbines, tidal energy and ocean energy.	**7**
	Total	**42**

11.Suggested Books

S. No.	**Name of Books/ Authors**	**Year of publication/ Reprint**
1.	Solar Cells by M. A. Green. / Prentice Hall	1981
2.	Principles of Solar Engineering by D. Y. Goswami, F. Kreith and J. F. Kreid/ Taylor & Francis	2000
3.	Fundamentals of renewable energy processes by Aldo Vieira da Rosa. / Academic pressElsevier) USA	2005
4.	Hand book of Energy Audits by Albert Thuman, P.E.,C.E.M. Fairmont Press Inc.	2003/
5.	Bio fuels by David M. Mousdale/ CRC Press Taylor & Francis	2008
6.	Bio fuel Engineering by caye M. Drapchoetal. / McGraw Hill	2008
7	Solar Engineering of Thermal Processes by J. A. Duffie and W. A. Beckman John Wiley & Sons	2006
8.	Solar Energy - Principles of thermal collection and storage by S. P. Sukhat	1996

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

Department Elective



DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

1. Subject code: **EP- 305** Course title: **Atomic and Molecular Physics**
2. Contact Hours: L: 3 T: 1 P: 0
3. Examination Duration (Hrs): Theory: 3 Practical: 0
4. Relative Weight: CWS: 25, PRS:--, MTE: 25, ETE: 50, PRE: --
5. Credits: 4
6. Semester: ODD
7. Subject area: DEC-1
8. Pre-requisite: Basic knowledge of Atoms and Molecules
9. Objective: The course provides basic understanding of the Nature, essential principles, fundamental techniques and their prospective applications

10. Detail of Course:

S. No.	Contents	Contact Hours
1.	Bohr-Sommerfeld theory of Hydrogen Atom, Quantum mechanics of Hydrogen atom: Angular momentum & Parity, Magnetic dipole moments, Electron spin and Vector atom model, Spin orbit Interaction: Hydrogen fine structure, Identical particles & Pauli's principle	**08**
2.	Helium Atom & its spectrum, Multielectron atoms: Hartree's field: Atomic ground states & periodic table, Spectroscopic terms: L-S & j-j couplings, Spectra of alkali elements, Spectra of alkaline earth elements	**07**
3.	The Zeeman effect, Paschen-Back effect, The stark effect, Hyperfine structure of spectral lines, The Breadth of Spectral lines, X-ray spectra, Fine structure in X-ray Emission Spectra, X-ray Spectra and Optical spectra	**06**
4.	Rotational spectroscopy: Rigid rotor, Rotational spectra of diatomic molecules, Intensities of spectral lines, Isotope effects, Non-Rigid Rotator, Rotation levels of polyatomic molecules: spherical, symmetric, and Asymmetric top molecules	**07**
5.	Vibrational spectroscopy: Vibration of diatomic molecules, Harmonic oscillator and Anharmonic oscillator, Vibrational-rotational couplings, Vibration of polyatomic molecules	**06**
6.	Electronic spectroscopy: Electronic spectra of diatomic molecules, vibrational coarse structure, Franck-Condon Principle, Dissociation energy and dissociation products, Rotational fine structure of Electronic-Vibration transition, Production of excited state, Radiative processes, Kasha's Rule, Jablonbski diagram, Luminescence, Photoluminescence, kinetics, Quantum yield and Lifetime	**08**
	Total	**42**

11.Suggested Books:

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

S. No.	Name of Books/ Authors	Year of publication/ Reprint
1.	Introduction to Atomic Spectra, by Harvey Elliott White /McGraw Hill	1934
2.	Principles of Modern Physics, by Robert B. Leighton McGraw Hill	1959/
3.	Molecular spectra and molecular structure I, II and III. Spectra of diatomic molecules by G. Herzberg/Prentice-Hall	1939
4.	Fundamentals of molecular spectroscopy by C. N. Banwell and E.M. McCash4/McGraw Hill	1994
5.	Principles of fluorescence spectroscopy by J.R. Lakowicz. Springer	1983

1. Subject Code: **EP-307** Course Title: **Biophysics**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0: MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DEC-1

S. No.	Contents	Contact Hours
1.	Background of membrane biophysics, Basic structure and composition of membrane, Donnan equilibrium, GHK, Ion transport system overview, Whole cell behavior: cardiac, Integration: from channels to whole cell, Whole cell behavior: currents, gating, kinetics, control, Measurement approaches, Automaticity and pacemakers, Excitation contraction coupling (cardiac and neuro), Cardiac EC coupling, structure and function, NMJ	**10**
2.	Ion channel structure and gating function, Common elements organized to make specific function, Protein structure, pore formation, charge field, Control of channel function, voltage activation, ligand activation, signaling, gating kinetics, Ion selectivity, Ion channel types and characterization, Channel types, structure, function, Same channels in different cell types, Molecular biology in ion channels, Sample channelopathies	**10**
3.	Modeling and simulation of channels, Stochastic processes, State transition mechanics and modeling, Examples of disease modeling, Whole cell behavior: neuron, Integration, Propagation, saltatory conduction, Neuron synapse, synaptic plasticity, Structure of the synapse, Electrochemical transduction, Postsynaptic integration and information processing.	**10**
4.	Modeling and simulation of whole cell EP, Review of HH formalism; modern extensions, Mathematical formulation, numerical implementation, examples of software, Strengths and limitations of simulation, Cardiac cell-to-cell communication, Gap junction structure, function	**12**
	Total	**42**

8. Pre-requisite : Nil
9. Objective : The student will be able to enhance the basic understanding of Bio-Physics
10. Details of Course :

11.Suggested Books:

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

1. . Subject Code: **EP-309** Course Title: **Quantum Information and Computing**

2.Contact Hours : L : 3 T : 1 P : 0

1. Examination Duration (Hrs.) : Theory : 3Practical : 0
2. Relative Weight : CWS : 25 PRS : 0: MTE : 25 ETE : 50 PRE : 0
3. Credits : 4
4. Semester : ODD
5. Subject Area : DEC-2
6. Pre-requisite : Nil
7. Objective : The student will be able to formulate and explain about research based emerging field quantum computing with the help of fundamental concepts of quantum mechanics, and will learn to formulate the Schrodinger equation to obtain eigenvectors and energies and describe the propagation of quantum information using logic gates in various fields.

10. Details of Course :

S.No	Name of Books	Year of publication/ Reprint
1	Biophysics: An Introduction Roland Glaser	**2000**
2	Molecular and Cellular Biophysics Meyer B. Jackson	**2006**
3	Introductory Biophysics: Perspectives on the Living State J.R. Claycomb and Jonathan Quoc P. Tran	**2010**
4	Quantitative Understanding of Biosystems: An Introduction to Biophysics Thomas M. Nordlund	**2011**

DRAFT SCHEME OF STUDY
Year 2 of B.Tech Program

S.No.	Contents	Contact Hours
1.	**UNIT I:** Introduction to Turing machines-classical probabilistic and deterministic Turing machines, Quantum Turing machines; introduction to computability, complexity, classical complexity and quantum complexity classes-Quantum Physics and Computers.	10

2.	**UNIT II:** Review of Quantum Mechanics- state vectors, superpositions, UNITary operators, hermitian operators, Schrödinger equation, Hamiltonian evolution, the concept of quantum measurement, the concept of qubits, quantum registers and quantum gates Quantum Algorithms. Introduction to quantum algorithms, Deutsch's algorithm, Shor's algorithm and Grover's search Algorithm, Physical implementation of simple quantum gates.	12
3.	**UNIT III:** Quantum Cryptography and Quantum Teleportation, real physical systems and technological feasibility Heisenberg uncertainty principle, polarization states of photons, quantum cryptography using polarized photons, entanglements.	10
4.	**UNIT IV:** Introduction to the EPR paradox, BELL's theorem, Bell basis, teleportation of a single qubit, review of some current experiments and candidate physical systems, technological feasibility of a quantum computer and the limitations imposed by noise.	10
	Total	**42**

11.Suggested Books

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Introduction to Quantum Computation and Information By Hoi-Kwong Lo, Tim Spiller, and SanduPopescu/World Scientific.	1998
2.	The Quantum Computer by Jacob West (, 2000). Web Page	April 28, 2000
3.	Quantum Computation and Quantum Information by Michael A. Nielsen & Isaac L. Chuang Cambridge University Press	2010 (10th ed.)

1. Subject Code: **EP-311** Course Title: **Computer Networking**
2..Contact Hours : L : 3 T : 1 P : 0
3Examination Duration (Hrs.) : Theory : 3Practical : 0
4.Relative Weight : CWS : 25 PRS : 0: MTE : 25 ETE : 50 PRE : 0
5.Credits : 4
6.Semester : ODD
7.Subject Area : DEC-2
8.Pre-requisite : Nil
9.Objective : The student will be able to understand about the computer networking and architectures

10. Details of Course :

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

11.Suggested Books

S. No.	Contents	Contact Hours
1.	**OSI Reference Model and Network Architecture:** Introduction to Computer Networks, Example networks ARPANET, Internet, Private Networks, Network Topologies: Bus-, Star-, Ring-, Hybrid -, Tree -,Complete -, Irregular –Topology; Types of Networks : Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer	**12**
2.	**TCP/IP:** Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, Transmission Control Protocol , User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Internet Control Protocols, ARP, RARP, ICMP, Application Layer, Domain Name System, Email – SMTP, POP,IMAP; FTP, NNTP, HTTP, Overview of IP version 6.	**10**
3.	**Local Area Networks:** Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.	**10**
4.	Wide Area Networks: Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed ueue Dual Bus (DQDB), Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), Frame Relay, Wireless Links. Introduction to Network Management: Remote Monitoring Techniques: Polling, Traps, Security management, Firewalls,VLANs, Proxy Servers	**10**
	Total	**42**

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Computer Networks (3rd edition), Tanenbaum Andrew S International edition	, 1996.
2.	Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, Addison Wesley, Low Price Edition.	2000,
3.	Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie,	2nd Edition
4.	Computer Networking – ED Tittel, , T.M.H.	2002

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

1. Subject Code: **EP-308** Course Title: **Laser and Instrumentation**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : EVEN
7. Subject Area : DEC-3
8. Pre-requisite : Basic knowledge LASER Physics, Quantum Mechanis & Optics
9. Objective : *1. Acquire fundamental understanding of the basic Physics behind optoelectronic devices.
2. Develop basic understanding of light emitting diodes.
3. Develop detailed knowledge of laser operating principles and structures.
4. Acquire in depth understanding of photo detectors
10. Details of Course:

S.No.	Contents	Contact Hours
1.	Laser Physics: Various common laser systems and applications, fabrication of lasers, optical amplifications, laser rate equations, gain coefficient, line broadening, optical resonators, Q-switchings, mode locking and pulse compression.	10
2.	Nonliear Optics: Nonlinear optical susceptibilities, harmonic generation, frequency conversion, phase matching	8
3.	Photonic Devices: Optical detectors, photomultiplier tubes, monochormator, CCD.	8
4.	Analytical Instruments: Spectrophotomers, FTIR, fluorescence and Raman Spectromenter, X-ray diffractometer, scanning electron microscopy, atomic force microscopy. Low Temperature: Gas liquefiers, Cryo-fluid path, liquid He cryostat design, low temperature measurement.	8
5.	Laboratory Component: Physical parameter measurement using different sensor; low pressure generation and measurement	8
	Total	**42**

11.Suggested Books

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Principles of Lasers by O. Svelto/Plenum Press	1998
2.	Non Linear Optics by R. W. Boyd Academic Press	2003/
3.	Modern Electronic Instrumentation and Measurement Techniques by A. D. Helfrick and W. D. Cooper/Prentice-Hall of India	1996
4.	Principles of Measurement Systems by J. P. Bentley/Longman	2000
5.	Experimental Techniques in Low Temperature Physics by G. K. White/Clarendon	1993
6.	Vacuum Technology by A. Roth	1990/Elsevier
7.	Principles of Instrumental Analysis by D. A. Skoog, F. J. Holler and T. A. Nieman/Saunders Coll. Publ.	1998

DRAFT SCHEME OF STUDY
(Year 3,3,4 B. Tech Program

1. Subject Code: **EP-310** Course Title: **MEDICAL PHYSICS AND PHYSIOLOGICAL MEASUREMENTS**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : EVEN
7. Subject Area : DEC-3
8. Pre-requisite : Nil
9. Objective : Acquire fundamental understanding of the applications of Physics in medical
10. Details of Course:

S. No.	Contents	Contact Hours
1.	Overview of Human body - Origin of bio-potentials -ENG, EMG,ECG and EEG	**12**
2.	Heart and ECG Waveform - standard lead system and functional blocks - Biofluid mechanics	**12**
3.	Blood pressure measurement - Different blood flow meters	**10**
4.	Electric impedance plethysmography - photo plethysmography - pulse oximetry.	**8**
	Total	**42**

11.Suggested Books

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Medical Physics and Biomedical Engineering, Brown, B.H. Institute of Physics Publishing, 2. John. G. Webster,	1999
2.	Medical Instrumentation : Application and Design	2nd Edition, John Wiley

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

1. Subject Code: **EP-312** Course Title: **FOURIER OPTICS AND HOLOGRAPHY**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : EVEN
7. Subject Area : DEC- 3
8. Pre-requisite : Basic knowledge of Modern Physics, Optics & Quantum Physics
9. Objective : * Information processing using optical techniques such as holography and Fourier transform is an important area of Modern Optics. In this course the fundamentals, techniques and applications of holography and Fourier optics will be provided.
10. Details of Course:

S.No.	Contents	Contact Hours
1.	Signals and systems, Fourier Transform(FT), Sampling theorem, Diffraction theory; Fresnel-Kirchhoff formulation and angular spectrum method	9
2.	brief discussion of Fresnel and Fraunhofer diffraction, FT properties of lenses and image formation by a lens; Frequency response of a diffraction-limited system under coherent and incoherent illumination	11
3.	OTF-effects of aberration and apodization, comparison of coherent and incoherent imaging, super-resolution; Techniques for measurement of OTF; Analog optical information processing: Abbe-Porter experiement, phase contrast microscopy and other simple applications; Coherent image processing:	9
4.	VanderLugt filter; joint-transform correlator; pattern recognition, Synthetic Aperture Radar.	8
5.	Basics of holography, in-line and off-axis holography; 3 12 Transmission and reflection holograms, Amplitude and phase holograms, Recording materials. Thick and thin holograms	5
	Total	**42**

11.Suggested Books

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Introduction to Fourier Optics by J.W.Goodman/Mc Graw Hill	1996
2.	Optical Holography, Principles, Techniques and Applications by Hariharan/ Cambridge Univ.Press	1996
3.	The Fourier Transforms and its applications by R.N.Bracewell/Mc Graw Hill	1965
4.	Linear systems, Fourier Transforms and optics by Gaskill.J/ Wiley	1978
5.	Fundamentals of Holography by Denisyuk, Y/ MIR Publisher	1984
6.	An Optical holography by R.J.Collier / Academic Press	1971

DRAFT SCHEME OF STUDY (Year 2,3,4) B.Tech Program

1. Subject Code: EP-314 Course Title: Instrumentation and Control

2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : EVEN
7. Subject Area : DEC-4
8. Pre-requisite : Nil

S. No.	Contents	Contact Hours
1.	**Instrumentation:** Transducers, classification & selection of transducers, strain gauges, inductive & capacitive transducers, piezoelectric and Hall-effect transducers, thermisters, thermocouples, photo-diodes & phototransistors, encoder type digital transducers, signal conditioning and telemetry, basic concepts of smart sensors and application	**12**
2.	Control System:Linear, Non Linear, Time Varying and Linear Time Invariant System, Servomechanism, Historical Development of Automatic Control and Introduction to Digital Computer Control, Mathematical Models of Physical Systems, Differential Equations of Physical Systems, Transfer Functions, Block Diagram Algebra and Signal Flow Graphs. Feedback and Non-feedback Systems Reduction of Parameter Variations By Use of Feedback Control Over System Dynamics By Use of Feedback Control of Effects of Disturbance Single By Use of Feedback and Regenerative Feedback.	**12**
3.	**Time and frequency response Analysis:** Standard test signals, Time responseofFirst order Systems, Time Response of Second-Order Systems, Steady-State Error and Error Constants, Effect of Adding a Zero to a System, P, PI and PID Control Action and Their Effect, Design Specifications of Second-Order Systems and Performance Indices. Correlation Between Time and Frequency Response, Polar Plots, Bode Plots, and All Pass and Minimum-Phase Systems.	**10**
4.	The Concept of Stability, Necessary Conditions for Stability, Hurwitz Stability Criterion, Routh Stability Criterion and relative Stability Analysis. The Root Locus Concept, Construction of Root Loci, Root Contours, Systems with Transportation Lag, Sensitivity of the Roots of the Characteristic equation, Mathematical Preliminaries, Nyquist Stability Criterion, Definition of Gain Margin and Phase Margin, Assessment of Relative Stability Using Nyquist Criterion and Closed-Loop Frequency Response.	**8**
	Total	**42**

9. Objective : Develop detailed knowledge of instruments and Control
10. Details of Course:

11.Suggested Books

DRAFT SCHEME OF STUDY (Year 2,3,4 B. Tech Program

S. No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Modern Electronic Instrumentation and Measurement Techniques by Helfrick and Cooper Prentice- Hall of India, Reprint	1988.
2.	Electrical Measurement and Measuring Instruments by Golding, E.W. 3rd Edition; Sir Issac Pitman and Sons,	1960.
3.	Control Systems Engineering by Nagrath& Gopal New Age International. Publishers	6th Edition
	Instrumentation Measurement and Feedback" by Jones,	1986

1. Subject Code: **EP-316** Course Title: **Cosmology and Astrophysics**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0

S. No.	Contents	Contact Hours
1.	Our place in the Universe: A tour of the Universe, its scale and contents (e.g. planets, stars, galaxies and the interstellar medium). Observational astronomy: the electromagnetic spectrum; geometrical optics (ray diagrams, focal length, magnification etc); diffraction (resolving power, Airy disc, diffraction limit etc); telescopes (reflecting, refracting, multi-wavelength).	**12**
2.	Properties of stars: brightnesses (luminosities, fluxes and magnitudes); colours (blackbody radiation, the Planck, Stefan-Boltzmann and Wien laws, effective temperature, interstellar reddening); spectral types; spectral lines (Bohr model, Lyman &Balmer series etc, Doppler effect); Hertzprung-Russell diagram; the main sequence (stellar masses, binary systems, Kepler's laws, mass-luminosity relations); distances to stars (parallax, standard candles, P-L relationships, m-s fitting etc); positions of stars (celestial sphere, coordinate systems, proper motions, sidereal and universal time).	**12**
3.	The life and death of stars: energy source (nuclear fusion, p-p chain, triple-alpha, CNO cycle, lifetime of the Sun); solar neutrinos; basic stellar structure (hydrostatic equilibrium, equation of state); evolution beyond the main sequence; formation of the heavy elements; supernovae; stellar remnants (white dwarfs, neutron stars, black holes, degeneracy pressure, Swarszchild radius, escape velocities). Planets & life in the Universe: formation of the stars and protoplanetary discs (molecular clouds, Jeans mass); contents of the solar system; planetary and cometary orbits; equilibrium temperatures; extrasolar planets (Doppler wobble, transits, microlensing; prospects); search for life elsewhere; SETI. Galaxies: Constituents of galaxies; stellar populations; the interstellar medium; HII regions; 21cm line; spirals and ellipticals; galactic dynamics; galaxy rotation curves and dark matter; active galaxies and quasars.	**10**
4.	Cosmology: Galaxies and the expanding Universe; Hubble's Law; the age of the Universe; the Big Bang; cosmic microwave background (blackbody radiation); big bang nucleosynthesis (cosmic abundances, binding energies, matter & radiation); introductory cosmology (the cosmological principle, homogeneity and isotropy, Olber's paradox); cosmological models (critical density, geometry of space, the fate of the Universe); dark energy and the accelerating Universe.	**8**
	Total	**42**

4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : EVEN
7. Subject Area : DEC-4
8. Pre-requisite : Nil
9. Objective : Acquire in depth understanding of Astronomy and cosmology
10. Details of Course:

DRAFT SCHEME OF STUDY
(Year 2, 2014 B. Tech Program

11.Suggested Books

S. No	**Name of Books, Authors**	Year of publication/reprint
1	Zeilik& Gregory, *Introductory Astronomy & Astrophysics*,(Saunders College Publishing	4th ed

2	Morison, I., *Introduction to Astronomy and Cosmology*	Wiley
3	Kutner, M.L., *Astronomy: A Physical Perspective*	Cambridge University Press
4	Green, S.F. & Jones, M.H., *An Introduction to the Sun and Stars*	Cambridge University Press
5	Jones, M.H. &Lambourne, R.J.A., *An Introduction to Galaxies & Cosmology*	Cambridge University Press
6	Carroll, B.W. &Ostlie, D.A., *An Introduction to Modern Astrophysics*	Pearson

1. Subject Code: **EP-409** Course Title: **Information Theory and Coding**

S. No.	Contents	Contact Hours
1.	**UNIT-I:** Review of probability theory, Definition of Information Measure and Entropy: Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark off source, Mutual information. Asymptotic Properties of Entropy and Problem Solving in Entropy	**08**
2.	**UNIT-1I:** Block Code and its Properties, Data compression, Kraft-Mcmillan Equality and Compact Codes, Encoding of the source output, Shannon's encoding algorithm, Coding Strategies, Huffman Coding, Shannon-Fano-EliasCoding and Introduction to Arithmetic Coding.	**08**
3.	**UNIT-III:** Introduction to Information Channels, Communication Channels, Discrete communication channels, Continuous channels. Discrete memory less Channels, Mutual information, Channel Capacity, Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem.	**08**
4.	**UNIT-IV:** Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding	**09**
5.	**UNIT-V:** Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. Convolution Codes, Time domain approach. Transform domain approach	**09**
	Total	**42**

2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DEC-5
8. Pre-requisite : Nil
9. Objective : To introduce information theory, the fundamentals of error control coding techniques and their applications
10. Details of Course

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program

11.Suggested Books

S. No.	Name of Books/Authors	Year of Publication/ Reprint
1	Digital and Analog Communication Systems by K. Sam Shanmugam / Wiley India Private Limited	2012
2	Digital Communications by Simon Haykin/ Wiley	2006

3	Information Theory, Coding and Cryptography by Ranjan Bose **McGraw Hill Education**	2008
4	Elements of Information Theory by Thomas M. Cover and Joy A. Thomas / Wiley	2013
5	Fundamentals of Information Theory and Coding Design by Roberto Togneri and Christopher J.S deSilva/ Chapman and Hall	2003
6	Introduction to Coding and Information Theory by Steven Roman / Springer	1997

S. No.	Contents	Contact Hours
1.	**UNIT-I:** Basic Numerical Methods and Classical Simulations: Review of differentiation, integration (quadrature), and finding roots. Integration of ordinary differential equations. Monte Carlo simulations, applications to classical spin systems. Classical Molecular Dynamics. .	**08**
2.	**UNIT-1I:** Quantum Simulations: Time-independent Schrodinger equation in one dimension (radial or linear equations). Scattering from a spherical potential; Born Approximation; Bound State solutions. Single particle time-dependent Schrodinger equations.	**08**
3.	**UNIT-III:** Hartree-FockTheory: restricted and unrestricted theory applied to atoms. Schrodinger equation in a basis: Matrix operations, variational properties; applications of basis functions for atomic, molecular, solid-state and nuclear calculations.	**08**
4.	**UNIT-IV:** Mini-projects on different fields of physics, e.g., Thermal simulations of matter using Car-Parrinello molecular dynamics; Many-Interacting-Particle Problems on Hubbard and Anderson model for electrons using Lanczos method (exact diagonalisation) for the lowest states	**09**
5.	**UNIT-V:** Quantum Monte Carlo methods; Computational methods for Lattice field theories; Microscopic mean-field theories (Hartree-Fock, Bogoliubov and relativistic mean-field); methods in nuclear many-body problems.	**09**
	Total	**42**

1. Subject Code: **EP-411** Course Title: **Advanced Simulation Techniques in Physics**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DEC-5
8. Pre-requisite : Nil
9. Objective : To develop the numerical skill of advanced level for solving the problem related to theoretical physics.

10. Details of Course:

DRAFT SCHEME OF STUDY
(Year 2,3,4 B. Tech Program)

11.Suggested Books

S. No.	Name of Books/Authors	Year of Publication/ Reprint
1	Introduction to Fortran 90 and 95 by S. J. Chapman/ McGraw Hill, Int. Ed.	1998

2	Computational Physics by S. E. Koonin and D. C. Meredith, 1990. / Addison-Wesley	1990
3	An Introduction to Computational Physics by Tao Pang/Cambridge University Press	2010
4	Computational Physics by R. H. Landau and M. J. P. Mejia 1997. /John Wiley	1997
5	Computational Physics by J. M. Thijssen, / Cambridge Univ Press	1999
6	Computational Physics by K. H. Hoffmann and M. Schreiber /Springer	1996

1. Subject Code: **EP-413** Course Title: **Continuum Mechanics**
2. Contact Hours : L : 3 T : 1 P : 0
3. Examination Duration (Hrs.) : Theory : 3 Practical : 0
4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0
5. Credits : 4
6. Semester : ODD
7. Subject Area : DEC- 5
8. Pre-requisite : Vector calculus , Elementary differential equations and elementary symbolic computing
9. Objective : * The continuum mechanics clearly brings out the general principles that are common to both solid and fluid mechanics. This subject also discusses necessity for assumption of solid and fluid i.e., in the form of constitutive equations. Further, the frame work of continuum mechanics is useful for understanding elasticity, plasticity, viscoelastcity and viscoplasticity.

10. Details of Course:

S. No.	Contents	Contact Hours
1.	Vector space, Cauchy-Schwartz inequality, and Triangle inequality, Dot product, Cross product, Outer product, Kronecker delta, Permutation symbol, Definition of tensor, Summation convention, Free index, Dummy index, Examples to understand notations, Operations on second-order tensors (SOT), Cofactor tensor, Invariants of SOT, Inverse of SOT, Eigenvalues and Eigenvectors, Geometric interpretation of eigenvectors, Cayley-Hamilton theorem	8
2.	Skew-symmetric, Orthogonal, and Symmetric tensors, Additive decomposition, Polar decomposition, Square root tensor, Calculus of Tensors	9
3.	Kinematics : Mapping function, Deformation gradient, Length, Area, and Volume, Material and spatial description, Rate of deformation, Spin tensors, Strain tensors, Rigid transformation, Leibniz rule of integration, Transport theorems	8
4.	Cauchy hypothesis and Cauchy theorem, Equation of motion, Angular momentum balance, Equation of motion in material coordinates, Piola Kirchhoff stress tensor, Energy balance, Second law of thermodynamics, Principle of material frame-indifference, Constitutive equations	8
5.	Linear elasticity: Applied Linear Elasticity: Mathematical solutions for plane stress, plane strain and axisymmetric boundary value problems, energy methods. Linear Viscoelasticity: Discrete models (Maxwell, Kelvin, Voigt), hereditary integrals, creep, stress relaxation, dynamic loading, hysteresis, Fluid mechanics: Introduction to Poroelasticity: Two-phase (fluid-solid) mixture models, balance laws for mass/momentum/energy, applications to biological tissues	9
	Total	**42**