SCHEME OF EXAMINATION

&

SYLLABI

for

Bachelor / Master of Technology (Dual Degree)
Electronics and Communications Engineering

Offered by

University School of Information Technology

1ST SEMESTER TO 8TH SEMESTER

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

Guru Gobind Singh Indraprastha University
Kashmere Gate, Delhi – 110 403 [INDIA]
www.ipu.ac.in

Semester I

Paper Code	Paper ID	Paper	C	L	T	P
Theory						
HS101	98101	Communications Skills – I	3	2	1	-
BA103	99103	Theory and Technology of Semiconductors	4	3	1	-
IT105	15105	Introduction to Computers	3	3	0	-
EC107	101107	Network Analysis	4	3	1	-
BA109	99109	Mathematics – I	4	3	1	-
BA111	99111	Physics – I	3	2	1	-
*HS119	98119	Impact of Science and Technology on Society - I	1	1	-	-
Practical						
BA151	99151	Theory and Technology of Semiconductors Lab.	1	-	-	2
BA153	101153	Engineering Physics – I Lab.	1	-	-	2
IT155	15155	Computer Lab.	1	-	-	2
IT157	15157	Engineering Graphics – I Lab.	1	-	-	2
EC159	101159	Network Analysis Lab.	1	-	-	2
HS161	101161	Communications Skills - I Lab.	1	-	-	2
Total			28	17	5	12

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Semester II

Paper Code	Paper ID	Paper	C	L	T	P
Theory						
HS102	98102	Communications Skills – II	3	2	1	-
EC104	101104	Analog Electronics – I	4	3	1	-
BA106	99106	Environment Studies	3	2	1	-
BA108	99108	Mathematics – II	4	3	1	-
BA110	99110	Physics – II	3	2	1	-
EC112	101112	Signals and Systems	3	2	1	-
*HS126	98126	Impact of Science and Technology on Society - II	1	1	-	-
Practical						
EC152	101152	Analog Electronics – I and Signal and Systems Lab.	2	-	-	4
IT154	15154	Engineering Graphics – II Lab.	1	-	-	2
BA156	99156	Physics – II Lab.	1	-	-	2
BA158	99158	Environment Studies Lab.	1	-	-	2
HS160	98160	Communications Skills– II Lab.	1	-	-	2
Total			27	15	6	12

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Semester III

Paper Code	Paper ID	Paper	C	L	T	P
Theory						
IT201	15201	Computational Techniques	4	3	1	-
EC203	101203	Communications Systems – I	4	3	1	-
EC205	101205	Engineering Electromagnetics	4	3	1	-
IT207	15207	Object Oriented Programming Using C++	4	3	1	-
EC209	101209	Digital Electronics	4	3	1	-
EC211	101211	Analog Electronics – II	4	3	1	-
Practical						
EC251	101251	Computational Techniques Lab.	1	-	-	2
EC253	101253	Communications Systems – I Lab	1	-	-	2
EC255	101255	Object Oriented Programming Using C++ Lab.	1	-	-	2
EC257	101257	Digital Electronics Lab.	1	-	-	2
EC259	101259	Analog Electronics – II Lab.	1	-	-	2
Total			29	18	6	10

Semester IV

Paper Code	Paper ID	Paper	C	L	T	P
Theory						
EC202	101202	VHDL based Design	4	3	1	-
EC204	101204	Communications Systems – II	4	3	1	-
EC206	101206	Transmission Lines, Waveguides and Antennas	4	3	1	-
EC208	101208	Control Engineering	4	3	1	-
EC210	101210	Data Structures and Algorithms	4	3	1	-
EC212	101212	Computer Architecture and Operating Systems	4	3	1	-
Practical						
EC252	101252	VHDL based Design Lab.	1	-	-	2
EC254	101254	Communications Systems – II Lab.	1	-	-	2
EC256	101256	Control Engineering Lab.	1	-	-	2
EC258	101258	Data Structures and Algorithms Lab.	1	-	-	2
Total			28	18	6	8

Semester V

Paper Code	Paper ID	Paper	C	L	T	P
Theory						
EC301	101301	Microwave Devices and Circuits	4	3	1	-
EC303	101303	Microprocessors and Interfacing	4	3	1	-
EC305	101305	Microelectronics	4	3	1	-
EC307	101307	Relational Database Management Systems	4	3	1	-
EC309	101309	Stochastic Systems and Processes	4	3	1	-
MS311	101311	Principles of Management	3	3	-	-
Practical						
EC351	101351	Microwave Devices and Circuits Lab.	1	-	-	2
EC353	101353	Microprocessors and Interfacing Lab.	1	-	-	2
EC355	101355	Microelectronics Lab.	1	-	-	2
EC357	101357	Relational Database Management Systems Lab.	1	-	-	2
*EC359	101359	Summer Training (held at the end of the IVth semester) Report	1	-	-	-
Total			28	18	5	8

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Semester VI

Paper Code	Paper ID	Paper	C	L	T	P
Theory						
EC302	101302	Digital System Processing and Applications	4	3	1	-
EC304	101304	Computer Networking	4	3	1	-
EC306	101306	Information Theory and Coding	4	3	1	-
EC308	101308	Telecommunications Networks	4	3	1	-
EC310	101310	Opto – Electronics and Optical Communications	4	3	1	-
EC312	101312	Mobile Communications	4	3	1	-
Practical						
EC352	101352	Digital System Processing and Applications Lab.	1	-	-	2
EC354	101354	Computer Networks Lab.	1	-	-	2
EC356	101356	Telecommunications Networks Lab.	1	-	-	2
EC358	101358	Opto-Electronics and Communications Lab.	1	-	-	2
Total			28	18	6	8

Semester VII

Paper Code	Paper ID	Paper	C	L	T	P
Theory						
IT417	15417	Embedded Systems	4	3	1	-
EC403	101403	Network Management and Security	4	3	1	-
Electives (Choose any two)						
EC405	101405	Measurement and Instrumentation	4	3	1	-
IT407	101407	Artificial Intelligence	4	3	1	-
EC409	101409	Introduction to Nanotechnology	4	3	1	-
EC411	101411	Neural Networks and Applications	4	3	1	-
EC413	101413	Software Engineering	4	3	1	-
EC415	101415	Radar and Navigation Engineering	4	3	1	-
EC417	101417	Reliability Engineering	4	3	1	-
EC419	101419	Computer Graphics and Multimedia	4	3	1	-
EC421	101421	Radio and Television Engineering	4	3	1	-
MS423	101423	Principles of Managerial Economics	4	4	-	-
MS425	101425	Principles of Organizational Behaviour	4	4	-	-
Practical						
EC451	101451	Embedded Systems Lab.	1	-	-	2
EC453	101453	Laboratory work based on Electives or MATLAB	2	-	-	4
EC455	101455	Minor Project	4	-	-	8
*EC457	101457	Summer Training (held at the end of the VIth semester) Report	1	-	-	-
Total			24	12-14	2-4	14

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Semester VIII

Paper Code	Paper ID	Paper	C	L	T	P
Theory						
*HS402	98402	Technical Writing	2	2	-	-
*HS424	98424	Ethics and Moral Values	1	1	-	-
Electives (Choose any two)						
IT404	15404	Advanced Computer Architecture	4	3	1	-
EC406	101406	Satellite Communications	4	3	1	-
EC408	101408	Power Electronics	4	3	1	-
IT410	15410	Soft Computing	4	3	1	-
EC412	101412	Multimedia Communications	4	3	1	-
MS414	101414	Financial Management	4	4	-	-
MS416	101416	Principles of Human Resource Management	4	4	-	-
EC418	101418	Digital Image Processing and Applications	4	3	1	-
EC420	101420	Fuzzy Logic and Systems	4	3	1	-
EC422	101422	Linear and Nonlinear Optimization Techniques	4	3	1	-
EC424	101424	Advances in Wireless Communications	4	3	1	-
EC426	101426	Object Oriented Programming Using Java	4	3	1	-
Practical						
EC452	101452	Laboratory work based on Elective or MATLAB	2	-	-	4
**EC454	101454	Major Project**	8	-	-	16
*EC456	101456	Seminar and Progress Report	1	-	-	-
Total			22	8-10	0-2	20

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**The student will submit a synopsis at the beginning of the semester for approved by the school committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

Note:

1. The total no. of credits of the Programme B. Tech. (ECE) = 214

2. Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn a minimum of 200 Credits.

Code: HS 101		**L**	**T/P**	**C**
Paper ID: 98101	**Paper: Communication Skills – I**	**2**	**1**	**3**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

I. Remedial Grammar
- (a) Simple sentences – their phrase structure
- (b) Parts of speech
- (c) Tense and concord
- (d) Gerunds, Participles & Infinitives
- (e) Complex and Compound sentences (Use of connectives)
- (f) Conditional clauses
- (g) Question tags & short responses
- (h) Common errors

II. Vocabulary and Usage
- (a) Synonyms & Antonyms
- (b) One word substitutions
- (c) Words often confused
- (d) Idioms / Idiomatic expressions
- (e) Foreign Phrases (Greek and Latin)

III. Presentation of Technical Information:
Technical description of
- (a) Simple objects, tools, appliances
- (b) Processes and operations
- (c) Scientific principles

IV. Composition:
- (a) Comprehension – Unseen passages
- (b) Dialogues – Creation of mock situations.
- (c) Debates – Discussing the pros and cons of a given topic.
- (d) Thematic Appreciation Exercises / Development of situational outlines.

V. Prose

Selected prose pieces from prescribed texts.

Code: BA 103		**L**	**T/P**	**C**
Paper ID: 99103	**Paper: Theory and Technology of Semiconductors**	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS:	**Maximum Marks : 60**
1.	Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2.	Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

(Each unit of 10 hours.)

Unit I:

Crystal Properties and Growth of Semiconductors: Types of Solids and their electrical properties, Semiconductor Materials, Periodic Structures, Crystal Lattices, Bulk Crystal Growth, Starting Materials, Wafers, Doping, Epitaxial Growth, Lattices Matching in Epitaxial Growth, Vapor Phase Epitaxy, Molecular Beam Epitaxy.
Atoms and Electrons: Physical Models, Experimental Observations, Photoelectric Effect, Atomic Spectra, Quantum Mechanics, Uncertainty Principle, Schrodinger Wave Equation, Potential Well Problem, Tunnelling, Atomic Structure and the Periodic Table, The Hydrogen Atom.

Unit –II:

Energy Bands and Charge Carriers in Semiconductors: Band theory for solids, semiconductors types, Charge carriers and their properties. Fermi Level Invariance of the Fermi level at equilibrium, Carrier concentration at Equilibrium, Temperature and doping effect on carrier concentration, conductivity and mobility, Compensation and Space Charge Neutrality, Effect of Electric and Magnetic Fields, Drift and Resistance, High – field effects, The Hall effect.

Unit – III:

Excess Carriers in Semiconductors: Optical absorption, Optical and Electro Luminescence, photoconductivity, direct and indirect combination of electrons and holes, Steady state Carrier Injection, carrier diffusion and drift, Diffusion Length, Haynes Shockley Experiment, Gradients in Quasi Fermi Level.

Unit – IV:

Junctions: Fabrication of p-n Junction (Thermal oxidation, diffusion, rapid thermal processing, ion implantation, chemical vapor deposition, photolithography, etching metallization). Contact potential, Equilibrium Fermi Levels, Space Charge at Junction, Junction Biasing, Current flow across junction, Zener breakdown, Rectifiers, Transient and AC conditions, Variation of stored charge, capacitance of p-n junctions, Transition region properties, Ohmic losses, graded junctions, Metal-semiconductor Junctions, Schottky Barriers, Rectifying contacts, Ohmic contacts, Hetrojunctions, different types of diodes and their prioperties. Optical Devices and their properties, Semiconductor Power Devices.

Text/Reference:

1. B. Streetman, “Solid State Electronic Devices”, Prentice Hall, 1994.
2. D. A. Neamen, “Semiconductor Physics and Devices: Basic Principles”, McGraw Hill, 2003 (3rd Ed.).
3. S. M. Sze and K. K. Ng, “Physics of Semiconductor Devices”, Wiley, 2007 (3rd Ed.).

Code : IT105		**L**	**T/P**	**C**
Paper ID:15105	**Paper: Introduction To Computers**	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS:	**Maximum Marks : 60**
1.	Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2.	Apart from Question No. 1, the students should be asked to attempt 2 questions from unit I (1 questions out of 2) and attempt 3 questions from Unit II (3 questions.out of 5).

Unit – I

Introduction: Overview of computer organization and historical perspective computer applications in various fields of science and management.

Data representation: Number systems, character representation codes, Binary, hex, octal codes and their inter conversions. Binary arithmetic, Floating point arithmetic, signed and unsigned numbers. Data Storage: Primary and Secondary storage, Introduction to various computer devices such as keyboard, mouse, printers, disk files, floppies etc. Concept of computing, contemporary, Operating Systems such as DOS, Windows'95, UNIX etc. (only brief user level description). Introduction to organization and architecture of mainframe, mini and micro systems. Introduction to E-mail, ftp, login and other network services, world wide web, MS-Office.

Introduction to Programming: Concept of algorithms, Flow charts, Example of Algorithms such as how to add ten numbers, roots of a quadratic equation. Concept of sequentially following up the steps of a algorithm.Notion of program, programmability and programming languages, Structure of programs, Object codes, compilers.

Introduction to the Editing tools such as vi or MS-VC editors. Concepts of the finite storage, bits, bytes, kilo, mega and gigabytes, Concepts of character representation. **(11 hours)**

Unit – II

Programming using C: The emphasis should be more on programming techniques rather that the language itself. The C programming language is being chosen mainly because of the availability of the compilers, books and other reference materials. Example of some simple C program. Dissection of the program line by line, Concepts of Variables, program statements and function calls from the library (printf for example)

- C data types, int, char, float etc.
- C expressions, arithmetic operations, relational and logic operations.
- C assignment statements, extension of assignment to the operations. C primitive input output using getchar and putchar, exposure to the scanf and printf functions.
- C statements, conditional executing using if, else. Optionally switch and break statements may be mentioned.
- Concepts of loops, example of loops in C using for, while and do-while, Optionally continue may be mentioned.
- One dimensional arrays and example of iterative programs using arrays, 2-d arrays. Use in matrix computations.
- Concept of Sub-programming, functions, Example of functions, Argument passing mainly for the simple variables.
- Pointers, relationship between arrays and pointers, Argument passing using pointers, Array of pointers, Passing arrays as arguments.
- Strings and C string library
  Structures and Unions. Defining C structures, passing strings as arguments, programming examples.
- File I/O, Use of fopen, fscanf and fprintf routines etc. **(30 Hours)**

Code: EC 107		**L**	**T/P**	**C**
Paper ID: 101107	**Paper: Network Analysis**	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS:	**Maximum Marks : 60**
1.	Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2.	Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

(Each unit of 10 hours.)

Unit – I:

Circuits: Voltage, Ideal Voltage Source, Current Ideal Current Sources, Classification of Circuits, Ohm's Law, Resistively, Temperature Effect, Resistors, Resistor Power Absorption, Nominal Values and Tolerances, Colour Codes, Open and Short Circuits, Internal Resistance. Operational Amplifiers. Capacitance, Inductance, Transformers.

Unit - II:

DC Circuits: Series and Parallel Circuits, Kirchhoff's Voltage and Current Law, Mesh Analysis, Loop Analysis, Nodal Analysis, Thevenin's and Norton's Theorem, Maximum Power Transfer Theorem, Superposition Theorem, Millman's Theorem, Tellegens Theorem, Y - Δ and Δ- Y Transformation, Bridge Circuits.

Unit – III:

AC Circuits: Circuits containing Capacitors and Inductors, Transient Response, Alternating Current and Voltages, Phasors, Impedences and Admittance, Mesh Analysis, Loop Analysis, Nodal Analysis, Thevenin's and Norton's Theorem, Y - Δ and Δ- Y Transformation, Bridge Circuits. Resonant Circuits, Complex Frequency and Network Function, Maximum Power Transfer Theorem, Superposition Theorem.

Unit IV:

Two port Networks. Passive Filters. Graph Techniques for Network Analysis, Laplace Transforms, Fourier series and Transform Methods for Network Analysis.

Text/Reference:

1. K. S. S. Kumar, "Electric Circuits and Networks", Pearson, 2009.
2. van Valkenberg, "Network Analysis", PHI/Pearson, 2000.
3. J. W. Nilsson and S.A. Riedel, "Electric Circuits", Pearson, 2008.
4. D. R. Choudhary, "Networks and Systems" New Age International, 1999.

Code: BA 109		L	T/P	C
Paper ID: 99109	Paper: Mathematics - I	2	1	3

1(a) Calculus of functions of One variable

(i) Successive Differentiation, Leibnitz's theorem (without proof). Lagrange's Theorem, Cauchy Mean value theorems, Taylor's theorem (without proof), Remainder term, Asymptotes, Curvature, Curve Tracing.

14 hrs

(ii) Infinite Series: Convergence, divergence, Comparison test, Ration Test, Cauchy n^{th} root test, Leibnitz's test (without proof), Absolute and Conditional Convergence, Taylor and Meclaurin series, Power Series, Radius of Convergence.

5 hrs

(iii) Integral Calculus: Reduction Formulae of trigonometric functions, Properties of definite Integral, Applications to length, area, volume, surface of revolution, Definition of improper integrals, Beta-Gamma functions.

8 hrs

1(b) Calculus of Functions of several variables:

Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials. Maxima, Minima and saddle points, Method of Lagrange multipliers. Differentiation under Integral sign, Jacobians and transformations of coordinates. Double and Triple integrals. Simple applications to areas, Volumes etc.

12 hrs

II Vector Calculus:

Scalar and vector fields, Curves, Arc length, Tangent, normal, Directional Derivative, Gradient of scalar field, divergence and curl of a vector field. Line integral (independent of path), Green's theorem, Divergence theorem and Stoke's theorem (without proofs), Surface Integrals.

12 hrs

Text/Reference:

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 6th edition, Addison-Wesley/Narosa, 1985.
2. Shanti Narayan, "Differential Calculus", S. Chand & Co.
3. Shanti Narayan, "Integral Calculus", S. Chand & Co.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publ.
5. E. Kreyszig, "Advanced Engineering Mathematics", 5th Edition, Wiley Eastern, 1985.
6. Murray R. Spiegel, "Theory and Problems of Vectors Analysis", Schaum's Outline Series, Mc Graw Hill Ed.
7. S.C. Malik, "Mathematical Analysis", Wiley Eastern Ltd.
8. "Advanced Calculus", Schaum's Outline Series, Mc Graw Hill Ed.
9. Widder, "Advanced Calculus", 2nd Edition, Prentice Hall Publishers.

Code: BA 111		L	T/P	C
Paper ID: 99111	Paper: Physics – I	2	1	3

I OPTICS

Polarization

Types of polarization, elliptically and circularly polarized light Brewsters law, Malu's law, Nicol prism, double refraction, quarter-wave and half-wave plates, optical activity, specific rotation, Laurent half shade polarimeter.

5 hrs.

Interference

Coherence and coherent sources, interference by division of wave front (young's double slit experiment, Fresnel's biprism), interference by division of amplitude (thin films, Newton's rings, Michelson's interferrometer, Fabry Perot interferrometer)

7 hrs.

Diffraction

(Fresnel and Fraunhofer types of diffraction) Fraunhofer difraction: Single slit, double slit, circular aperture and N-slit, diffraction grating wavelength determination, resolving power and dispersive power, Fresnel Diffraction: Zone plate, circular aperture, opaque circular disc, narrow slit.

7 hrs.

II LASER AND FIBRE OPTICS

Lasers

Introduction, coherence, Einstein A and B coefficients, population inversion, basic principle and operation of a laser, type of lasers, He-Ne laser, Ruby laser, semiconductor laser, holography-theory and applications.

5 hrs.

Fibre Optics:

Introduction to optical fibre, types of optical fibres and their characteristics, (Attenuation and dispersion step index and graded index fibres, principle of fibre optic communication-total internal reflection, numerical aperture, fibre optical communication network (qualitative)-its advantages.

5 hrs.

III Theory of relativity

Absolute and Inertial frames of reference, Galenlian transformations, Michelson-Morley experiment, the postulates of the special theory of relativity, Lorentz transformations, time dilation, length contraction, velocity addition, mass energy equivalence.

5 hrs.

Recommended Books

1. Concepts of Modern Physics: A. Beiser
2. Modern Physics: Kenneth Krane
3. Fundaments of Optics: Jenkins and White
4. Optics: Ghatak
5. Fundamental of Physics by RESNICK & HALLIDAY

Practicals:

Code: BA151		L	T/P	C
Paper ID:99151	**Paper: Theory and Technology of Semiconductors Lab.**	**0**	**2**	**1**

Practicals based on BA103.

Code: BA153		L	T/P	C
Paper ID:99153	**Paper: Physics– I Lab.**	**0**	**2**	**1**

Practicals based on BA109.

Code: IT155		L	T/P	C
Paper ID:15155	**Paper: Computer Lab.**	**0**	**2**	**1**

Practicals based on IT105.

Code: IT157		L	T/P	C
Paper ID:15157	**Paper: Engineering Graphics –I**	**0**	**2**	**1**

1. General
   Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic projections, B.I.S. Specifications.

2. Projections of Points and Lines
   Introduction of planes of projection, Reference and auxiliary planes, projections of points and lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes, shortest distance intersecting and non-intersecting lines.

3. Planes Other than the Reference Planes
   Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points and lines lying in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.

4. Projections of Plane Figures
   Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection.

5. Projection of Solids
   Simple cases when solid is placed in different positions, Axis, faces and lines lying in the faces of the solid making given angles.

6. Development of Surface
   Development of simple objects with and without sectioning.

7. Nomography
   Basic concepts and use.

Code: EC159			L	T/P	C
Paper ID:101159	**Paper: Network Analysis Lab.**	**0**	**2**	**1**	

Practicals based on EC107.

Code: HS161	**L**	**T/P**	**C**
Paper ID:98161 Paper: Communications Skills – I Lab.	**0**	**2**	**1**

Practicals based on HS101.

Code: HS102		L	T/P	C
Paper ID:98102	Paper: Communication Skills – II	1	2	3

1. Some Key Concepts:
   Communication as sharing; context of communication; the speaker/writer and the listener/reader; medium of communication; barriers to communication; accuracy, brevity, clarity and appropriateness in communication.

2. Writing:
   Selecting material for expository, descriptive, and argumentative pieces; business letters; formal report; summarizing and abstracting; expressing ideas within a restricted word limit; paragraph division, introduction and the conclusion; listing reference material; use of charts, graphs and tables; punctuation and spelling; semantics of connectives, modifiers and modals, variety in sentences and paragraphs.

3. Reading Comprehension:
   Reading at various speeds (slow, fast, very fast), reading different kinds of texts for different purposes (e.g., for relaxation, for information, for discussion at a later stage, etc.); reading between the lines.

4. Speaking:
   Achieving desired clarity and fluency; manipulating paralinguistic features of speaking (voice quality, pitch, tone, etc.); pausing for effectiveness while speaking, task-oriented, interpersonal, informal and semiformal speaking; making a short classroom presentation.

5. Group Discussion:
   Use of persuasive strategies including some rhetorical devices for emphasizing (for instance; being polite and firm; handling questions and taking in criticism of self; turn-taking strategies and effective intervention; use of body language).

6. Listening Comprehension:
   Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English and American English, intelligent listening in situations such as an interview in which one is a candidate.

Code: EC 104	**L**	**T/P**	**C**
Paper ID: 101104 Paper: Analog Electronics – I	**3**	**1**	**4**

INSTRUCTIONS TO PAPER SETTERS:	**Maximum Marks : 60**
1.	Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2.	Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

(Each unit of 10 hours.)

Unit- I

Junction Diode Charactersistics: Review of semi conductor Physics – n and p –type semi conductors, Hall Effect, Fermi level in intrinsic and extrinsic semiconductors, Open-circuited p-n junction, The p-n junction Energy band diagram of PN diode, PN diode as a rectifier (forward bias and reverse bias), The current components in p-n diode, Law of junction, Diode equation, Volt-ampere characteristics of p-n diode, Temperature dependence of VI characteristic, Transition and Diffusion capacitances, Step graded junction, Breakdown Mechanisms in Semi Conductor (Avalanche and Zener breakdown) Diodes, Zener diode characteristics, Characteristics of Tunnel Diode with the help of energy band diagrams, Varactar Diode, LED, and photo diode

Unit- II

Trasister and FET Characteristics: Junction transistor, Transistor current components, Transistor as an amplifier, Transistor construction, Detailed study of currents in a transistor, Transistor alpha, Input and Output characteristics of transistor in Common Base, Common Emitter, and Common collector configurations, Relation between Alpha and Beta, typical transistor junction voltage values, JFET characteristics (Qualitative and Quantitative discussion), Small signal model of JFET, MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET, Comparison of Transistors, Introduction to SCR and UJT.

Unit-III

Biasing and Stabilisation: BJT biasing, DC equivalent model, criteria for fixing operating point, Fixed bias, Collector to base bias, Self bias techniques for stabilization, Stabilization factors, (S, S', S''), Compensation techniques, (Compensation against variation in V_{BE}, I_{co},) Thermal run away, Thermal stability,

Unit-I V

Amplifiers and Oscillators: Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters: voltage gain, current gain, Input impedance and Output impedance. Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on input and output characteristics, Condition for oscillations. RC-phase shift oscillators with Transistor and FET, Crystal oscillators.

Text :

1. Electronic Devices and Circuits – J.Millman, C.C.Halkias, and Satyabratha Jit Tata McGraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits – Salivahanan and others TMH.
3. Electronic Devices and Circuits – D. R. Cheruku and B. T. Krishna, Pearson, 2008

References:

1. Electronic Devices and Circuits – T.F. Bogart Jr., J.S.Beasley and G.Rico, Pearson Education, 6th edition, 2004.
2. Principles of Electronic Circuits – S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn.., 1998.
3. Microelectronics – Millman and Grabel, Tata McGraw Hill, 1988.
4. Electronic Devices and Circuit Theory – R. L. Boylestad and L. Nashlesky, Pearson, 10th Ed., 2009.

Code: BA106		**L**	**T/P**	**C**
Paper ID: 99106	**Paper: Environment Studies**	**2**	**1**	**3**

INSTRUCTIONS TO PAPER SETTERS:	**Maximum Marks : 60**
1.	Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2.	Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

(Each unit of 7 hours.)

Unit-I:

Definition, scope and importance, need for public awareness, introduction to concept of green technology. Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources-green fuel. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Resource Management-Sustainable development.

Unit-II:

Air Pollution - Types of pollutants, source, effects, sink & control of primary pollutants– CO, NO_X, HC, SOx and particulates, effect of pollutants on man & environment: photochemical smog, acid rain and global warming, CO_2 Sequestration. Water Pollution - Classification of Pollutants, their sources, waste water treatment (domestic and industrial). Soil Pollution – Composition of soil, classification and effects of solid pollutants and their control.

Unit – III:

Solid Waste Pollution – Classification, waste treatment and disposal methods; compositing, sanitary land filling, thermal processes, recycling and reuse methods. Hazardous wastes - Classification, radioactive, biomedical & chemical, treatment and disposal- Physical, chemical and biological processes. Marine Pollution – Causes, effects and control of marine pollution, coastal zone management. Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides.

Unit-IV:

Polymer synthesis, Environmental degradation of polymers, photodegradable polymers, hydrolysis and hydro-biodegradable polymers, biopolymers and bioplastics, thermal degradation of plastics during recycling. Bioaccumulation, biodegradation, bioremediation, bioleaching, Biomethanation, Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology. Environmental Impact Assessment, Some important Environmental laws, Green bench, Carbon Credits, Environmental Management System standards-ISO 14000 series.

Text/Reference:

1. Roger Perman et. al., Natural Resources & Environmental Economics, 2nd Ed., Longman, USA, 2000
2. Stern, A.C. (1980), Air Pollution, Vol. 1-VIII, Academic Press.
3. James M., Lynch & Alan Wiseman, Environmental Bio-monitoring : The Biotechnology Ecotoxicology Interface, Cambridge University Press, 1998.
4. John Glasson, Riki Therivel and Andrew Chadwick, Introduction to Environmental Impact Assessment, 2nd Ed., UCL Press, Philadelphia, USA, 1994.
5. Richard K. Morgan, Environmental Impact Assessment: A methodological perspective, Kluwar Academic Publications, Boston, 1998.
6. Gabriel Bitton, Wastewater Microbiology, 2nd Ed., Wiley-Liss, New York, 1999.
7. Environmental Chemistry & Pollution Control, S. Chand & Co. (Latest ed.), By S.S. Dara
8. Environmental Chemistry, I.K. Publishers, 2007, Balaram Pani
9. Environmental Chemistry, New Age Int. Publ. (Latest ed.), A.K. De.
10. Environmental Studies, S.K. Kataria Publ. . (Latest ed.), S.K. Dhamija.
11. A text book in Environmental Science, Narosa Publ. 2007, V. Subramanian.

Code No.: BA108		L	T/P	C
Paper ID:99108	**Paper: Mathematics-II**	**3**	**1**	**4**

1. Linear Algebra: Vector spaces – linear independence and dependence of vectors, inner products, Inner product spaces, Matrices and determinants, Linear transformations, Systems of linear equations-consistency and inconsistency, Gauss elimination, rank of a matrix, inverse of a matrix, Bilinear, Quadratic, Hermitian, Skew-Hermitian Forms, Eigenvalues and Eigenvectors of a matrix, diagonalization of a matrix, Cayley-Hamilton Theorem (without proof).

2. Ordinary Differential Equations: Formation of ODE's, definition of order, degree and solutions. ODE's of first order: Method of separation of variables, homogeneous and nonhomogeneous equations, exactness and integrating factors, linear equations and Bernoulli equations, General linear ODE's of nth order: solutions of homogeneous and nonhomogenous equations, operator method, method of undermined coefficients and variation of parameters, Solutions of simple simultaneous ODE's. Power series method of solution of DE, Legendre's Equation, Legendre's Polynomials, Bessel's equation, Bessel's function.

3. Complex Variables: Curves and Regions in the Complex Plane, Complex Functions, Limits, Derivative, Analytic Function, Cauchy-Riemann Equations, Laplace's Equation, Rational, Exponential, Trigonometric, Hyperbolic Functions, Linear Fractional Transformations, Conformal Mapping, Complex Line Integral, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function, Power Series, Taylor Series, Laurent Series, Methods of obtaining Power Series, Analyticity at Infinity, Zeroes, Singularities, Residues, Residue Theorem, Evaluation of Real Integrals.

4. Probability and Statistics: Random Variables, Discrete and Continuous Distribution, Mean and Variance of a Distribution, Moments, Moment Generating Functions, Skewness, Kurtosis, Binomial, Poisson, Normal Distributions, Testing of Statistical Hypothesis, F-Test, T-test, χ^2-test.

Code: BA110		L	T/P	C
Paper ID:99110	Paper: Physics – II	2	1	3

I. Quantum Mechanics:

Wave particle duality, deBroglie waves, evidences for the wave nature of matter – the experiment of Davisson and Germer, electron diffraction, physical interpretation of the wave function and its properties, the wave packet, the uncertainty principle.

4 hrs.

The Schrodinger wave equation (1-dimensional), Eigen values and Eigen functions, expectation values, simple Eigen value problems – solutions of the Schrodinger's equations for the free particle, the infinite well, the finite well, tunneling effect, simple harmonic oscillator (qualitative), zero point energy.

6 hrs.

II. Quantum Statistics

The statistical distributors: Maxwell Boltzmann, Bose-Einstein and Fermi-Dirac statistics, their comparisons, Fermions and Bosons Applications: Molecular speed and energies in an ideal gas, The Black body spectrum, the failure of classical to give the correct explanations – the applications of Bose-Einstein statistics to the Black body radiation spectrum, Fermi-Dirac distribution, free electron theory, electronic specific heats, Fermi energy and average energy – its significance.

10 hrs.

III. Band Theory of Solids

Origin of energy bands in solids, motion of electrons in a periodic potential – the Kronig – Penny model, Brillouin zones, effective mass, metals, semi-conductors and insulators and their energy band structures, Extrinsic and Intrinsic semiconductors, doping-fermi energy for doped and undoped semiconductors, the p-n junction (energy band diagrams with fermi energy), the unbiased diode, forward and reverse biased diodes –tunnel diodes, zener diode, photo diode its characteristics, LED, Introduction to transistors.

10 hrs.

IV. Overview of Electro-Magnetism

Maxwell's Equations: The equation of continuity for Time-Varying fields, Inconsistency in ampere's law, Maxwell's Equations, conditions at a Boundary Surface, Introduction to EM wave.

4 hrs.

Recommended Books:

1. Concept of Modern Physics: A Beiser
2. Modern Physics: Kenneth Krane
3. Solid State Physics: Kittle
4. Electronic Principles: Malvino
5. Statistical Mechanics: Garg Bansal and Ghosh (TMH)

Code: EC 112	**L**	**T/P**	**C**
Paper ID: 101112 Paper: Signal and Systems	**2**	**1**	**3**

INSTRUCTIONS TO PAPER SETTERS:	**Maximum Marks : 60**
1.	Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2.	Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

(Each unit of 07 hours.)

Unit- I

Continuous and discrete time signals: Classification of Signals – Periodic aperiodic even – odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – properties of discrete time complex exponential unit impulse – unit step impulse functions – Transformation in independent variable of signals: time scaling, time shifting. Determination of Fourier series representation of continuous time and discrete time periodic signals – Explanation of properties of continuous time and discrete time Fourier series. Representation of continuous time signals by its sample - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals.

Unit – II:

Continuous time Fourier Transform and Laplace Transform analysis with examples – properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Parseval's relation, and convolution in time and frequency domains.

Basic properties of continuous time systems: Linearity, Causality, time invariance, stability, magnitude and Phase representations of frequency response of LTI systems -Analysis and characterization of LTI systems using Differential Equations and Continuous time LTI systems. Laplace transform: Computation of impulse response and transfer function using Laplace transform.

Unit – III:

Discrete time system analysis using Difference equations, Discrete Time Fourier Transform, Discrete Fourier Transform, FFT and their property and usage in the analysis of Discrete time systems.

Basic principles of z-transform - z-transform definition – region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z-transform and Fourier transform. Properties of convolution and the interconnection of LTI Systems – Causality and stability of LTI Systems. Computation of Impulse & response & Transfer function using Z Transform.

Unit – IV:

Systems with finite duration and infinite duration impulse response – recursive and non-recursive discrete time system – realization structures – direct form – I, direct form – II, Transpose, cascade and parallel forms.

Text / Reference:

1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, Signals & Systems, 2nd edn., Pearson Education, 1997.
2. John G.Proakis and Dimitris G.Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, 3rd edn., PHI, 2000.
3. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
4. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999
5. K.Lindner, "Signals and Systems", McGraw Hill International, 1999.
6. Moman .H. Hays," Digital Signal Processing ", Schaum's outlines, Tata McGraw-Hill Co Ltd., 2004.
7. B. P. Lathi, "Signal Processing and Linear System", Berkeley Cambridge Press, 1998.
8. H. P. Hsu, "Schaum's Outlines of The Theory and Problems of Signals and Systems", McGraw-Hill, 1995.
9. S. Poornachandra, "Signal and Systems", Thomson Learning, 2004.

Practicals:

Code: EC152		L	T/P	C
Paper ID:101152	**Paper: Analog Electronics – I and Signal and Systems Lab.**	**0**	**4**	**2**

Practicals based on EC104 and EC112.

Code: IT154		L	T/P	C
Paper ID:15154	**Paper: Engineering Graphics Lab.**	**0**	**2**	**1**

Basic Concepts

I. S. drawing conventions, line symbols, kinds of line, drawing sheet lay-out, rules of printing, preferred scales.

2. Projections

Perspective, orthographic, isometric and oblique projections, isometric scale, isometric drawing, Technical sketching.

3. Shape Description (External)

Multiplanar representation in first- and third angle systems of projections, glass-box concept, sketching of orthographic views from pictorial views, precedence of lines.

Sketching of pictorial (isometric and oblique) views from Multiplanar orthographic views, Reading exercises, Missing line and missing view exercises.

4. Shape Description (Internal)

Importance of sectioning, principles of sectioning, types of sections, cutting plane representation, section lines, conventional practices.

5. Size Description

Dimensioning, tools of dimensioning, Size and location dimensions, Principles of conventions of dimensioning, Dimensioning exercises.

6. Computer Aided Drafting

Basic concepts and use.

Code: BA156		L	T/P	C
Paper ID:99156	**Paper: Physics– II Lab.**	**0**	**2**	**1**

Practicals based on BA110.

Code: BA158		L	T/P	C
Paper ID:99158	**Paper: Environment Studies Lab.**	**0**	**2**	**1**

Practicals based on BA106.

Code: HS160		L	T/P	C
Paper ID:98160	**Paper: Communications Skills - II Lab.**	**0**	**2**	**1**

Practicals based on HS102.