

UNIVERSITY OF DELHI

Syllabus

of

B.E. Electronics & Communication Engineering

at

Delhi College of Engineering

Semester I
Semester II
Semester III
Semester IV
Semester V
Semester VI
Semester VII
Semester VIII



Syllabus applicable for students seeking admissions to the B.E.
(Electronics & Communication Engineering Course)

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**FACULTY OF TECHNOLOGY
(UNIVERSITY OF DELHI)
NEW SCHEME OF EXAMINATION**

1. There shall be the following four year Degree Courses under the Faculty of Technology:
 - (i) Bachelor of Engineering (Electrical)
 - (ii) Bachelor of Engineering (Electronics & Communication)
 - (iii) Bachelor of Engineering (Mechanical)
 - (iv) Bachelor of Engineering (Civil)
 - (v) Bachelor of Engineering (Production & Industrial)
 - (vi) Bachelor of Engineering (Polymer Science & Chemical Technology)
 - (vii) Bachelor of Engineering (Computer)
 - (viii) Bachelor of Engineering (Instrumentation & Control)

2. In addition to the conditions laid down in Ordinance I, a candidate seeking admission to any of the above Courses of study for the Bachelor's Degree should satisfy the following conditions.
 - (a) **Educational Qualifications:**

A candidate passing any one of the following examinations and securing 60 per cent or more marks in the aggregate of Physics, Chemistry and Mathematics shall be eligible for admission to the first Semester of Bachelor of Engineering Course provided he/she has passed in each subject separately;

 - (i) Senior School Certificate Examination (12 year Course of the Central Board of Secondary Education (C.B.S.E), New Delhi.
 - (ii) Indian School Certificate Examination (12 Year Course) of the Council for Indian School Certificate Examination, New Delhi.
 - (iii) B.Sc. (Gen.) Group 'A' final Examination of the University of Delhi or equivalent examination.
 - (iv) B.Sc. (Hons.) Examination in Physics, Chemistry and Mathematics of the University of Delhi with Combination of Physics, Chemistry, Mathematics and equal weightage to the subsidiary subjects or equivalent examination.

- (v) Any other examination recognised as equivalent to the Senior School Certificate Examination of the C.B.S.E. by the University of Delhi.

A candidate must additionally have passed English as a subject of study either at the 10th class level or 12th class level (core or elective).

Note: There shall be no direct admission to any level of the Courses above the 1st Semester.

3. Under each B.E. Degree Course certain subjects are offered which can be classified as Theory/Practical/Drawing/Design/Project/Practical Training. Further classification is based on the relationship of the subjects with the degree courses admitted to, namely Humanities & Social Science/Basic Sciences/Allied Engineering, Departmental, Core, etc.

In addition to the above, a subject could be classified as a compulsory one or as one of the pre-requisite for another subject. The committee of Courses and studies of the concerned Department shall do this classification.

4. A student who joins the first semester will be automatically, deemed to have registered for the subjects which are listed under the first Semester of the SUGGESTED SCHEME OF LEARNING. Every student is required to register for the subjects to be taught in the second and subsequent semesters. This process of registration shall start just before the start of next semester. The student will also indicate during registration of subject/subjects of earlier Semester (s) in which he/she desires to appear, if otherwise eligible. Such a student will be allowed to appear in the End Semester Examination and his/her marks of mid terms activities will remain unaltered since attendance is compulsory, a student will be permitted to register for course/courses which he can attend. The number of theory subjects permitted will not be more than five. The total duration of contact Periods should not ordinarily exceed thirty hours per week.
5. B.E. Degree shall be awarded if a student has earned a minimum of 220 credits as specified in each degree programme subject to break up and compulsory credit as mentioned there in. However, a student may register in subjects leading to a maximum of 240 credits in the entire course.

A student should keep a watch on his progress and register in those papers in which he must earn the credit to satisfy the above requirement of the particular degree.

If a student earns more than a specified minimum credit for degree the best marks in the minimum credits (satisfying the above conditions) will be considered for the purposes of classification of result.

5. Evaluation and Review:

The Committee of Courses and studies in each department shall specify the following for the degree course:

- (a) Suggested Scheme of Learning;
- (b) Minimum credits needed for the degree course and break up in terms of classification of courses i.e.
 - (i) Humanities and Social Sciences
 - (ii) Basic Sciences
 - (iii) Allied Engineering
 - (iv) Departmental core
 - (v) Practical Training
 - (vi) Unspecified /Electives and
 - (vii) Major Project

The Committee of Courses & Studies in each department shall appoint one or more Evaluation-eum-Review Committees each dealing with a group of subjects. This E.R.C. consist of the teachers who are likely to teach subjects in the group.

The E.R.C. has the following functions:

- (i) To recommend appointment of paper setters/examiners of various examinations at the start of each Semester.
- (ii) To get prepared quizzes, assignments, test papers etc. for the mid-term and the end semester examination and to get them evaluated. Normally each concerned teacher, who is also a member of E.R.C., will do this job for his class. However, in exceptional circumstances any part the work will be entrusted to some other member of E.R.C.
- (iii) The mode of evaluation of the mid-term activities whose weightage shall be 30% and the end of term examination whose weightages shall be 70% (The mid-term activities will be one mid term test or 20% weightage which will be supplemented by assignments, quizzes etc. for a theory course with weightage of 10%). For a practical Course, 30% weightage be given for internal evaluation and 70%

for End Semester Examination. At the end of the Semester, the E.R.C. Chairman will send to the University the consolidated marks for the mid-term activities and the End semester in separate column for tabulation and for declaration of results.

- (iv) To consider the individual representation of students about evaluation and take the remedial action if needed. After scrutinizing the E.R.C. may alter the marks awarded upward/downward. The decision of the ERC shall be final. The candidate shall apply for the same on a prescribed proforma alongwith the evaluation fee prescribed by the University from time to time only for the End Semester Examination with in seven days from the date of declaration of result.
- (v) To moderate the quiz/assignment/test papers given by each concerned teacher in class with a view to maintain uniformity of standards and course coverage amongst various classes and to attain stipulated level of learning.
- (vi) To review and moderate the mid term and end of term results of each class with a view to maintain uniformity of standards and course coverage amongst various classes and to attain stipulated level of learning.
- vii) To lay guide-lines for teaching a subject.

Classification of Result:

A student has to secure 40% or more marks in a subject evaluation to earn the credits assigned to the subject. A student after having secured the minimum credit as needed for the degree course will be eligible for the award of degree. The final result will be evaluated as below:

Each subject will carry 100 marks.

$$\text{average Marks} = \frac{\sum(\text{Credits} \times \text{Marks Secured})}{(\sum \text{Credits})}$$

* (See clause 5 for best grades in the minimum credits)

The final result will be classified based on the average marks as follows.

First Class with Distinction 75% or more

First Class 60% or more but less than 75%

Second Class 50% or more but less than 60%

Pass Class 40% or more but less than 50%

8. A Student has to put in a minimum of 75% attendance separately in each Subject for which he has registered. A relaxation up to a maximum of 25% may be given on the production of satisfactory evidence that:

- (a) The student was busy in authorized activities.
- (b) The student was ill.

Note: (i) A student should submit the evidence to the above fact within three working days of resuming the studies. Certificates submitted later will not be considered.

(ii) No relaxation in attendance beyond 25% is permitted in any case.

(iii) The registration of a student stands cancelled if his attendance requirements are not satisfied in the subject.

The duration of the course is not less than 8 Semesters and the span is not more than 14 semesters.

A student who earns 15 credits or less at the end of the first semester will receive a warning for his/her poor performance, if he fails to earn at least 25 credits at the end of the second semester, he has to leave the course and institution.

In case a student has not earned a minimum of 100 credits at the end of eight semester, his admission to the course and the institution stands cancelled. The admission stands cancelled at the end of 14th Semester in any case.

10. The institution/University may cancel the registration of all the subjects in a given semester if:

- 1. The student has not cleared the dues to the institution/hostel.
- 2. A punishment is awarded leading to the cancellation.

At discretion of the institution the result may be withheld even if the registration of the student stands.

11. There shall be a Central Advisory Committessisting of the following:

- (a) Dean, Faculty of Technology, (Chairman of the Committee)
- (b) Heads, of the Institutions
- (c) Heads of the Departments in the Faculty of Technology.

This Committee shall have the following functions.

- (i) lay guidelines for the process of registration.
 - (ii) give an interpretation of the rules in case of difference of opinion which shall be binding on all.
12. Under very exceptional conditions minor relaxations in rules may be allowed and implemented by the Central Advisory Committee. However, same relaxation in rules can not be granted in a subsequent semester. In case the conditions warrant such a relaxation again, the rules shall have to be amended.

GENERAL NOTES:

1. For all Theory Papers (Code: TH) there is one mid-semester test, of 30 marks (20+10 Assignments) and an end-semester exam of 3 hours duration for 70 marks. The total marks for the Theory Paper is thus 100.
2. For all practical Papers (code: PR) there is semester assessment of marks and an end-semester exam of 3/4 hours duration for 70 marks. The total marks for the Practical Paper is thus 100.
3. For all valuation of Sessional (Code: Vs) there is Semester assessment of 100 marks. There is no end-semester exam for these courses.
4. At VII and VIII Semester level there is assessment of Practical Training Reports by a duly constituted Board. The report is to be submitted by the student after eight weeks of Industrial Training undergone during summer/winter breaks. The total marks associated with each Practical Training Report is 100 marks of which 30 marks are awarded by the Department on the basis of supervision of Industrial Training.
5. At VIII Semester level there is assessment of Project Report by a duly constituted Board. The report is to be submitted by the student of the Project. Work performed at the VII and VIII Semester levels. The total marks associated with the Project Report is 100 marks of which 30 Marks are awarded by the Department on the basis of guidance of Project Work.
6. The total credits in all scheme of Examinations to B.E. Courses upto VIII Semester will be 232 and the denominator for Calculation of average marks for final result will be 220.

7. The Project and the practical Training at VII & VIII Semester are mandatory.
8. Candidates securing 228 to 232 credits are declared to have passed B.E. Final Examination.
9. Candidates securing 221 to 227 credits are declared to have passed B.E. Final examination provided they skip/fail in not more than 4 credits in CORE
10. Candidates securing exactly 220 credits are declared to have passed B.E. final examination, provided they skip/fail in not more than 4 credits in CORE, not more than 4 credits in APPLIED ENGINEERING and not more than 4 credits in APPLIED SCIENCES & HUMANITIES.

SUGGESTED SCHEME FOR B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

IEC	5	4		Credits
TH1	EC	101	Humanities	4
TH2	EC	102	Mathematics I	4
TH3	EC	103	Physics I	4
TH4	EC	104	Chemistry	4
TH5	EC	105	Manufacturing Processes	4
PR1	EC	106	Engineering Drawing I	3
PR2	EC	107	Physics I	2
PR3	EC	108	Chemistry	2
PR4	EC	109	Workshop I	2
				29
2EC	5	4		
TH1	EC	111	Principles of Electrical Engg.	4
TH2	EC	112	Applied Mechanics	4
TH3	EC	113	Mathematics II	4
TH4	EC	114	Physics II	4
TH5	EC	115	Electrical Engg. Materials	4
PR1	EC	116	Principles of Electrical Engg.	2
PR2	EC	117	Applied Mechanics	2
PR3	EC	118	Physics II/Elect. Engg. Materials	4
PR4	EC	119	Workshop II	2
				30

3EC	5	4	1		
TH1	EC	201	Electronics I		4
TH2	EC	202	Circuits and Systems I		4
TH3	EC	203	Electrical Machines I		4
TH4	EC	204	Electrical Measurement		4
TH5	EC	205	Mathematics III		4
PR1	EC	206	Electronics I		2
PR2	EC	207	Electrical Machines I		2
PR3	EC	208	Electrical Measurement		2
PR4	EC	209	Machine Drawing		3
VS1	EC	210	Programming I		1
					30
4EC	5	5	2		
TH1	EC	211	Electronics II		4
TH2	EC	212	Electromagnetics		4
TH3	EC	213	Network Analysis & Synthesis		4
TH4	EC	214	Digital Circuits & Synthesis		4
TH5	EC	215	Electrical Machines II		2
PR1	EC	216	Electronics II		2
PR2	EC	217	Digital Circuits & Systems I		2
PR3	EC	218	Electrical Machines II		2
PR4	EC	219	Electronic Workshop & Elect. Drg.		2
PR5	EC	220	Practical Training (Duration 4 weeks in Winter Break in the College Workshop)		2
VS1	FC	221	Report-Writing		1
VS2	FC	222	Programming II		1
					32
5EC	5	5	2		
TH1	EC	301	Transmission Lines & Wave Guides		4
TH2	EC	302	Control Engineering		4
TH3	EC	303	Computer Systems & Organisation		4
TH4	EC	304	Linear Integrated Circuits		4
TH5	EC	305	Ind. Org. & Managerial Economics		4
PR1	EC	306	Computer Systems & Organisation		2
PR2	EC	307	Linear Integrated Circuits		2
PR3	EC	308	Control Engineering		2
VS1	EC	309	Programming III		1
					27

EC 404 & EC 405 Elective I & II

Any two of the following Papers:

1. Digital Signal Processing I
2. Biomedical Electronics
3. Satellite Communications
4. Advanced Electronic Devices
5. Optical Fibres
6. Power Electronics
7. Switching automata
8. Computer Aided Design
9. Microprocessor Application

EC 412 & 413 Electives III & V

Any two of the following Papers:-

1. Introduction to VLSI Design
2. Modern Control Theory
3. Digital signal Processing II
4. Operating system
5. Computer Software Engg.
6. Computer Communication and Electronic Switching
7. Laser System
8. Radar System
9. Computer Oriented Optimisation Techniques
10. Fault Tolerant Computing.

B.E. (Electronics & Comm. Engg.) 1 Year Semester

Examination Theory

Paper I EC 101 Humanities (English)

(Same as COE 101, EE 101 and IC 101)

LTP

310

(A) Text : Essay, Short Stories and One Act Plays : Editor, R.K. Kaushik & S.C. Bhatia Published by Oxford University Press

The following chapters are prescribed for study.

(i) Essays :

1. Nehru the Democrat by M. Chalapatli Rao
2. Bores by E.V. Lucas
3. Freedom by George Bernard Shaw
4. What I require from Life by J.B.S Haldane
5. Student Mobs by J.B. Priestley

(ii) Short stories :

1. The fortune-teller by Karal Capek
2. Grief by Anton Chekov
3. The Doll's House by Katherine Mansfield

(iii) One Act Plays :

1. A Marriage proposal by Anton Chekov
2. The Boy comes Home by A.A. Milne

(B) ENGLISH LANGUAGE PRACTICE

Applied Grammar :

Common errors, Use of words, Synonymous and Antonyms, Formation of words-Prefixes and Suffixes

Presentation of Technical Information :

Technical description of (i) Simple objects, tools and appliances (ii) Processes and operations (iii) Scientific principles.

Composition :

Comprehension, Dialogues-conversational and colloquial idiom.

Spoken English :

Practice in self expression talks, Lecture and speeches.

B.E. (Electronics & Comm. Engg.) 1 Year Semester

Examination Theory L T P

Paper I EC 102 Mathematics I 3 1 0

Same as COE 102 and IC 102

Algebra 3 Partial Fraction : Hyperbolic and inverse hyperbolic functions, De-Moivre's Theorem and its applications; Relations between circular and hyperbolic functions; Positive term infinite series and their convergence (Comparison and Ratio tests), Alternating series.

Differential Calculus : Derivatives of hyperbolic functions; successive differentiation and Leibnitz's theorem. Taylor's and Maclaurin's series, Maxima and minima of functions of one variable; curvature and radius of curvature, points of inflexion.

Integral Calculus : Integration by partial fractions ; Integration of forms $I, I/R$ where $R = ax^2 + bx + C$; Properties of definite Integrals.

Reduction formulae : Application of integration to areas, length of arcs, surface and volume of solids of revolutions, Trapezoidal and Simpson's rules.

B.E. (Electronics & Comm. Engg.) 1 Year Semester

Examination Theory L T P

Paper III EC 103 Physics I 3 1 0

(Same as EE 103, COE 103 and IC 103)

Relativity : Absolute and inertial frames of reference, Newtonian (Galilean) relativity Galilean transformation, Michelson Morley experiment and its implications, Lorentz Transformation Einstein's law of addition of velocities. Mass variation with velocity, concept of energy and momentum as four vector, Einstein's mass-energy relation.

Inverse Square Law of Forces : Fundamental interactions, Electro-magnetic and gravitational interactions. Force and potential Control Force.

Invariance and Symmetry Principles. Invariance of a Physical quantity, laws of conservation of momentum, energy and charge, concept of symmetry and its implications.

Wave Oscillations. Free damped and forced oscillatory motions, Resonant vibrations with applications sharpness of resonance quality factor.

Formation of waves in strings rods and air, acoustic waves, acoustic impedance, transmission through partitions, ultrasonic and its applications.

Interference of Light. Wave theory of light, superpositioning principle, Double slit experiment, Bi-prism and Newton's ring, Theory of interference in thin films, interference filters, Michelson's interferometer.

Diffraction of Light. Fresnel and Fraunhofer class of diffraction. Diffraction at straight edge corners spiral, Fraunhofer diffraction at a slit and its extension for number of slits, Diffraction gratings. Resolving power of optical instrument, telescope, prism and grating.

Polarization of Light. Elementary aspects of e.m., theory of light, polarization, reflection and transmission, Brewster law, polarisation due to pile of plates and Double refraction, Elliptically and circularly polarized light, Nicol prism, quarter and half-wave plate.

Polarimeters. Half shade & Pi-quartz.

Optical Instruments. Cardinal points of a co-axial lens system, Defects in the images, spherical and chromatic aberration, Nodal slide assembly, Eye pieces.

B.E. (Electronics & Comm. Engg.) 1 Year 1 Semester

Examination Theory

L T P

Paper IV EC 104 Chemistry

3 1 0

(Same as COE 104, EE 104 and IC 104)

Chemical Kinetics:

Rate constant, order and molecularity of a reaction, 1st, 2nd, 3rd order reactions, Methods of determining order of reactions effect of catalyst on reaction rate, Activating energy, Industrial application of catalysts.

Electro-Chemistry :

Transport number, Galvanic Cells, E.M.F. and its measurements, Near-est equation of electrode potentials, Reference and Indicator electrodes at measurements, solar energy.

Phase Rate :

Phase diagrams and phase transformation in Pb-Ag and Cu-Ni systems,

Thermal Methods of Analysis :

Elementary discussions of thermogravimetric analysis, Differential thermal analysis and differential scanning calorimetry.

Metals and non-Metals of Elements :

S and P block elements, Bonding in complexes, Molecular explanations for magnetic properties and colour, extraction and technical applications of titanium, Vanadium, zirconium, Tungsten and Uranium.

Alloys Classification :

Necessity for making alloys composition, properties and uses of following alloys, Brass, Bronze, Gun metal, Duralumin, Effect of alloying elements like C, Ni, Mn, Si, V, Mo, W and Co on the properties of steel.

Electronic-Effects :

Inductive effects, Configuration and resonance and their effect on physical and chemical properties of molecules, carbanion and carboniumions and free radicals.

Organic Polymers :

Polymerisation, Effect of polymer structure on properties, production, properties and technical applications of some important thermoplastics and thermosetting resins, Natural rubber and elastomers (SNR, GR. I, GR-P polyurethane and silicon) Molecular weights.

Oils, Fats, Waxes and Detergents :

Production and physio-chemical properties of fatty acids and Glycer-

ides, Manufacture of edible fats, soap Glycerine, waxes, essential oils, perfumes and cosmetics.

B.E. (Electronics & Comm. Engg.) 1 Year 1 Semester

Examination Theory

Paper V EC 105 Manufacturing Process

(Same as COE 105 and IC 105)

Materials :

Composition, Properties and uses of wrought iron, pig iron, cast iron, malleable iron, S.G. Iron, carbon and alloy steels, copper, Aluminium, lead, brass bronze, duralumin, bearing metals, high temperature metals, cutting tool materials.

Casting Processes :

Principles of metal casting : pattern materials, types and allowance : study of moulding, sand moulding, tools, moulding materials, classification of moulds, description and operation of cupola : special casting processes e.g. diecasting, permanent mould casting, centrifugal casting, investment casting.

Smithy and Forging :

Basic operations e.g. upsetting, fullering, flattening, drawing, swaging, tools and appliances, drop forging, press forging.

Metal Joining :

Welding principles, classification of welding techniques; Oxy-acetylene Gas welding, equipment and field of application, Arcwelding, metal Arc, Carbon Arc, submerged arc and atomic hydrogen arc welding, Electrical resistance welding : spot, seam, Butt, Butt seam and percussion welding, Flux; composition, properties and function and percussion welding, Flux; composition, properties and function, Electrodes.

Types of joints and edge preparation.

Brazing and soldering.

Sheet Metal Work :

Common processes, tools and equipment; metals uses for sheets standard specification for sheets.

Bench Work and Fitting :

Fitting, sewing, chipping, thread cutting (die), tapping study of hand tools, marking and marking tools.

*B.E. (Electronics & Comm. Engg.) 1 Year 1 Semester**Examination Practical**Paper VI EC 106 Engineering Drawing I*

(Same as COE 106 and IC 106)

Introduction:

Instruments and their uses; letterings construction and uses of various scales; dimensioning as per I.S.I. 696-1972.

Engineering Curves:

Parabola; Hyperbola; ellipses; cycloid, involute; spiral, helix and loci of points of simple moving mechanism (4 bars chain)

Projections:

Straight lines; planes and solids; development of surfaces of right and oblique solids; section of solids, interpenetration and intersection of solids; isometric and oblique parallel projection of solids.

*B.E. (Electronics & Comm. Engg.) 1 Yr. 1 Sem.**Examination Practical**Paper II EC 107 Physics I*

(Same as COE 107 and EE 107)

Based on course work corresponding to EC 103 Physics I

B.E. (Electronics & Comm. Engg.) 1 Yr. 1 Sem.

<i>Examination Practical</i>	LTP
<i>Paper II EC 108 Chemistry</i>	003
(Same as COE 108 and EE 108)	

Based on course work corresponding to EC 104-Chemistry.

B.E. (Electronics & Comm. Engg.) I Yr. I Sem.

<i>Examination Practical</i>	LTP
<i>Paper IV EC 109 Workshop I</i>	003
(Same as COE 109 and EE 109)	

Practical based on course work corresponding to EC 105

Manufacturing Processes.

B.E. (Electronics & Comm. Engg.) I Yr II Sem.

<i>Examination Theory</i>	LTP
<i>Paper I EC II Principles of Electrical Engg.</i>	310
(Same as EE 111, COE 11 and IC 111)	

Properties of Conductors and Insulators: Factors affecting resistivity of conductors and insulators, resistance temperature co-efficient, insulation resistance, non-linear resistance and resistors, incremental and differential resistance.

Electromagnetism: The magnetic circuit calculations, magnetic screening: B-H Curve and differential permeability, hysteresis, electromagnets, self and mutual Inductance, non-linearity of inductance.

D.C. Circuits: Ohm's law, Kirchoff's Law, Networks simplification by loop current and node voltage methods, star delta transformations.

Alternating Currents: Introduction to alternating quantities, peak, average and R.M.S. value of sinusoidal and few typical non-sinusoidal wave forms, crest factor and form factor, Phasor representation in rectangular, polar and exponential forms, Series and Parallel circuits containing R-L-C and concept of phase, active and reactive power and meaning of power factor operator.

Resonance: Series and parallel resonance, Q-factor of a coil, band-

width, relation between Q, bandwidth and resonant frequency, Half power points.

Polyphase Circuits: Analysis of balanced 3-phase circuits, Introduction to unbalanced circuits.

Measuring Instruments: Construction of permanent magnet moving coil ammeters and voltmeters, torque equation, construction of moving iron instruments, attraction and repulsion type.

B.E. (Electronics & Comm. Engg.) 1 Yr. II Sem.

Examination Theory LTP

Paper II EC 112 Applied Mechanics 310

(Same as EE 112 and IC 112)

Basic Laws:

Force, moment of a force, couple, equivalent force system, equation of equilibrium, solution of simple plane trusses by analytical and graphical methods, frictional force, first moment and second moment of area.

Simple Stresses and Strains:

Description of tensile, compressive shear and volumetric stresses and strains; complementary shear stress, lateral strain and Poisson's ratio.

Bending Moment and Shear Force Diagrams:

Cantilevers and simply supported beams carrying various types of loads.

Theory of Simple Bending:

Determination of bending stresses : deflection of beams.

Torsion:

Stresses and strains in pure torsion for solid and hollow circular shafts: power transmitted by shafts.

Combine Stresses and Strains:

Principal stresses, strains, combined torsion, bending and direct stresses.

strains, combined torsion, bending and direct stresses, equivalent bending and twisting moments.

B.E. (Electronics & Comm. Engg.) 1 Yr. II Sem.

Examination Theory LTP

Paper III EC 113 Mathematics II 310

(Same as COE 113 and IC 113)

Differential Calculus: Partial differentiation, total differentiation, Taylor's series for functions of two variables, Maxima and Minima of functions of two or more variables.

Matrices: Inverse of a matrix, Rank of a matrix, Consistency and solution of simultaneous equation. Linear transformations, Vector spaces, Characteristic equations, Eigen values and Eigen vectors, Caley-Hamilton theorem.

Integral Calculus: Double and triple integrations; Change of order of integration, Volumes of simple solids.

Differential Equations: Linear differential equations of first order and first degree (Leibnitz and Bernoulli's forms); General linear differential equations with constant coefficients, Operator D, Complimentary function, particular integral, Simultaneous linear differential equations, Solution of differential equations in power series, Frobenius method.

Laplace Transformation: Laplace transformation, Inverse Laplace transformation, Convolution Theorem, Application to linear differential equations with constant coefficients, Unit step function, Impulse functions/periodic functions.

B.E. (Electronics & Comm. Engg.) 1 Yr. II Sem.

Examination Theory LTP

Paper IV EC 114 Physics II 310

(Same as EE 114)

Electromagnetics: Gauss theorem and its application, Dipole moment, Polarization and Dielectric materials, Ampere circuital theorem, magnetic force on current carrying conductors in magnetic field, solenoid, Faraday

and Lenz's Law of electromagnetic induction growth and decay of current in R-L & R-C circuits.

Statistical Physics: Maxwell classical distribution law, degree of freedom and law of equipartition of energy, mean free path.

Quantum statistics-Fermi-Dirac and Bose-Einstein distribution, Fermi-Dirac probability function.

Quantum Physics: Difficulties with classical physics, Black body radiation, photoelectric effect; size and stability of atom and Bohr's Postulates, de Broglie hypothesis, Schrodinger wave equation, interpretation of wave function, particle in a potential box, Pauli's exclusion principle.

Nuclear Physics: Structure of nucleus, binding energy, discovery of neutrons, Properties of slow and fast neutrons, particle detectors and accelerators, artificial radioactivity, fission and fusion, nuclear reactors.

B.E. (Electronics & Comm. Engg.) 1st Yr. 1st Sem

<i>Examination Theory</i>	13P
Paper VEC 115 <i>Electrical Engg. Materials</i>	310
(Same as EE 115)	

SECTION A

Crystal Structure: Bravais lattices, Miller indices, Simple crystal structures, different kinds of bonding.

Metallic Conduction: Energy Distribution of electrons in a metal, Fermi level, conduction process, Super conductivity.

Semi Conductors: Band theory of solids, P & N type of semiconductors, statistics of holes and electrons, Hall effect, Effect of temperature on conductivity, Life time and recombination; drift and diffusion in p-n junction Transistor action.

Magnetic Materials: Dia, para, Ferro-magnetism, Antiferro, ferri-ferro-magnetism, ferrites.

Super Conductors: Types of superconductors; Meissner effect, Josephson's effect, High temperature superconductors, Future applications.

SECTION B

Water Chemistry: Hardness of water, determination of hardness and its removal, Boiler problems due to hard water and remedies against these problems.

Refractories and Ceramics: Classification physicochemical factors affecting the uses of refractories, preparation of ceramics substrate for making chips.

Dielectrics and Insulating materials: Production, properties and uses of dielectrics and solids, liquid, gaseous, thermal and electrical insulating materials.

Chemical Treatment to Solar Cell Wafers: Solid cell wafers, dimension stability, metal requirement, surface treatment, solvent cleaning.

Electrodeposition: Structure, properties and factors affecting electrodeposit surfaces, electro winning and electrodeposition of Cu, Rh, Pt, Sn, Pb-Sn, brass and Ag-Pb, Manufacture of PCB.

Solid State Electrochemistry: Intrinsic and impurity semi-conductivity i.e. Si and Ga-As semiconductors; fuel cells and solid state batteries

B.E. (Electronics & Comm. Engg.) I Yr. II Sem.

Examination Practical 1TP

Paper I EC 116 Principles of Electrical Eng. 002

Practicals based on course work corresponding to EC 111

B.E. (Electronics & Comm. Engg.) I Yr. II Sem.

Examination Practical 1TP

Paper II EC 117 Applied Mechanics 002

Based on course work corresponding to Paper II EC 112

B.E. (Electronics & Comm. Engg.) I Yr. II Sem.

Examination Practical 1TP

Paper III EC 118 Physics III/Electrical Engg. 002

Materials

Laboratory practicals based on the course work corresponding to Paper

IV and V Physics II/Elect. Engg. Materials

B.E. (Electronics & Comm. Engg.) I Yr. II Sem.

Examination Practical

LTP

Paper IV EC 119 Workshop II

003

Practicals on drilling, lathe, milling and shaping machines based on EC 105

B.E. (Electronics & Comm. Engg.) I Yr. II Sem.

Sessional

Programming (Non-Examination)

B.E. (Electronics & Comm. Engg.) II Yr. III Sem.

Examination Theory Paper I

LTP

EC 201 Electronics I

310

(Same as for COE 201)

Semiconductor Devices: PN Junctions characteristics, Zener and avalanche breakdown, diode equation, junction capacitance, Diode Applications as clipper Clamper and comparator bipolar transistor, transistor current components, transistor characteristics in CB, CE and CC configuration, Ebers-moll model of a transistor, D.C. load line and graphical analysis of CE amplifier, transistor as a switch, transistor ratings, transistor hybrid parameters and equivalent circuits, analysis of elementary transistor amplifier in CB, CE, CC configurations, Miller's Theorem and its dual, Simple cascaded circuits, Simplified equivalent circuit, transistor biasing and stabilization.

Field Effect Devices: Junction field effect transistor, JFET voltampere characteristics, MOSFET, FET, small signal model parameters.

Special Devices: Unijunction transistor, zener diode, thyristors—SCR, diacs, triacs, LED, LCD, Photodiode, Solar Cell, phototransistor.

Power supplies, Half wave, full wave and bridge rectifiers, smoothing filters, Zener Regulator.

B.E. (Electronics & Comm. Engg.) I Yr. III Sem.

Examination Theory

LTP

Paper II EC 202 Circuits and Systems

310

(Same as IC 202 and COE 202)

1. Introduction to continuous time and discrete-time signals and systems: basic continuous-time and discrete-time signals, unit step, ramp and impulse, differential and difference equation formulation for linear-time-invariant (LTI) continuous-time and discrete-time systems.
2. Review of Laplace transform (LT) properties and solution of differential equations using LT; waveform synthesis and LT of complex waveforms: concept of transform impedance, Network functions; Two-port parameters, interconnections of 2-port networks, reciprocity; Network Theorems (Thelvenin, Norton, Millman, Maximum power transfer). Block diagram representation of LTI continuous-time networks and systems. Time-domain analysis of LTI networks using Laplace transform, relation between impulse response and system function, convolution integral; concept of poles and zeros, relation between location of poles, time-response and stability.
3. Fourier transform, basic theorems, application to LTI networks, frequency response; Fourier series representation of periodic non-sinusoidal signals, application to analysis of LTI networks.
4. Introduction to graph theory and Z-transforms.

B.E. (Electronics & Comm. Engg.) II Yr. III Sem.

Examination Theory

LTP

Paper III EC 203 Electrical Machines I

310

D.C. Generators: Basic constructional features, principles of operation, lap and wave connections, brief ideas about armature reaction and commutation, E.M.F. Equation, methods of excitation, characteristics of separately, shunt, compound and series excited generators, concept of parallel operations, Losses and efficiency applications.

D.C. Motors: Torque equation; characteristics of shunt, compound and series excited d.c. motors, starting of d.c. motors, three point starter for d.c. shunt motor; speed control, brief idea about speed control by chopper, applications.

Cross-Field Machines: Amplidyne, metadyne.

Transformers: Basic constructional features, types of transformers; principle of operation, e.m.f. equation, no load operation, operation under

load, equivalent circuits, phasor diagram, voltage regulation, losses and efficiency condition for maximum efficiency, short circuit and open circuit tests, applications of single phase transformers, Auto transformers, transformers in three phase circuits, 3 phase to 6-phase, 3-phase to 2-phase connections.

B.E. (Electronics & Comm. Engg.) II Yr. III Sem.

Examination Theory

LTP

Paper IV EC 204 Electrical Measurements

310

(Same as COE 204)

Units: S.I. System of units, dimensions and standards; errors in measurement.

Electrical Circuit Components: Resistance, inductance, capacitance measurement of Low, medium and high resistance and use of different d.c. bridges; measurement of inductance and capacitance using different a.c. bridges, d.c. and a.c. potentiometers and their application.

Indicating Instruments: Construction and theory of D' Arsonval galvanometer and its uses as moving coil ammeters and voltmeters; moving iron type ammeters and dynamometer type wattmeter, induction type energy meter; vibration galvanometers, magnetic oscillographs.

Electronic Measurement: Basic principles of vacuum tube and transistor voltmeter, D.V.M., multimeters, electronic wattmeters C.R.O., and its applications.

Measurement of Non-Electrical Quantities: Various types of transducers, measurement of displacement, speed, stress and strain.

B.E. (Electronics & Comm. Engg.) II Yr. III Sem.

Examination Theory

LTP

Paper V EC 205 Mathematics III

310

(Same as IC 205 and COE 205)

Vector Analysis: Triple products of vectors, differentiation of a vector. The operators grad, div. and curl and their geometrical and physical significance, Integration of vectors, work done in vector fields, Green's, Stoke's and Gauss divergence theorems.

Fourier Series: Fourier Series, Euler's formulae, Even and odd functions, functions having arbitrary periods, half range expansions, Harmonic Analysis.

Special Functions: Beta and Gamma Functions, Bessel functions of first kind, Recurrence relations, Modified Bessel function of first kind, Ber and Bei functions, Legendre Polynomials, Rodrigue's formula, Orthogonal expansion of functions.

Functions of Complex Variables: Analytic functions, Harmonic conjugate. Conformal transformation of functions $az + b$, z^2 , $1/Z$, cz , $(az + b)/(cz + d)$, Cauchy's integral theorem, Cauchy's integral formula; Residue theorem, Evaluation of real integrals.

B.E. (Electronics & Comm. Engg.) II Yr. III Sem.

Examination Practical LTP

Paper I EC 206 Electronics I 002

Based on the course work corresponding to EC 201 Electronics I

B.E. (Electronics & Comm. Engg.) II Yr. III Sem.

Examination Practical LTP

Paper II EC 207 Electrical Machines I 002

Lab. practical based on work corresponding to paper III EC 203 Electrical Machines I

B.E. (Electronics & Comm. Engg.) II Yr. III Sem.

Examination Practical LTP

Paper III EC 208 Electrical Measurements 002

Based on course work corresponding to EC 204 Electrical Measurements.

B.E. (Electronics & Comm. Engg.) II Yr. III Sem.

Examination Practical LTP

Paper IV EC 209 Machine Drawing 002

(Same as COE 209)

Introduction: Conventional representation of common features and materials as per I.S.I. 696-1972, various rolled sections and their uses.

Screw Thread: Projections and forms of screw threads and their conventional representation as per I.S.I. 529-1972.

Free hand sketching and scale Drawings: Component like pipe fitting and joints, turn buckle, shaft couplings, bolts, nuts and keys, bush bearing and ball bearings.

B.E. (Electronics & Comm. Engg. I) II Yr. III Sem.

<i>Examination Sessional</i>	LTP
<i>Paper I EC 210 Programming I</i>	210
<i>(Same as COE 210)</i>	

Computer Languages: Basic concepts of Fortran language; arithmetic expressions; simple input and output statements; flow charts; loop instructions format statements I, F, E, X, H, T, field specifications; transfer of control; statement-GO TO, arithmetic IF, logical IF, Do statement; subscripted variables, Dat. and Type statements, The statement function; Function sub:ogram; Sc :routine, Sub-program; Common and Equivalence statements Logical operations.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

<i>Examination Theory</i>	LTP
<i>Paper II EC 211 Electronics II</i>	310
<i>(Same as COE 211)</i>	

Amplifier Fundamentals: Dynamic transfer characteristic, decibel notation, distortion in amplifiers, comparison of bipolar transistor EET amplifier, classification of amplifiers, noise in amplifiers, noise figure.

Small Signal Amplifier: High frequency effects and hybrid pie model, frequency parameter of RC coupled amplifier using bipolar transistor, FET and gain bandwidth product, multistage amplifiers, emitter follower at low frequency and high frequency, Darlington connection, source follower, cascade amplifier.

Power Amplifiers: Single ended and pushpull amplifiers, class B power amplifiers, conversion efficiency, power considerations and heat sinks.

Feedback Amplifiers and Oscillators: Principles of feedback in ampli-

fiers, advantages of negative feedback, effect of feedback on impedance, Nyquist criterion for stability, Barkhausen criterion for sinusoidal oscillators, phase shift oscillator, Wein Bridge oscillator, crystal oscillators, frequency stability.

Transistorised Regulators (Series Regulator): IC Fabrication.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

<i>Examination Theory</i>	LTP
<i>Paper II EC 212 Electro-Magnetics</i>	310
(Same as COE 212)	

Mathematical Orientation: Review of gradient, curl and divergence operations, volume, surface and line integrals, vector identities, coordinate system and transformation of vectors in various coordinate systems, dirac delta function.

Static Electric Fields: Coulomb force, field due to number of charge, charge density functions, Dirac delta representation of charges, field due to various sources, scalar potential method of evaluating fields, fields in dielectrics, polarization, D and P Vectors, electric dipole and dipole moments, concept of a simple medium, boundary conditions, capacitors, energy stored in electric fields, Solution of Laplace equation of various coordinate systems by separation of variables, field mapping and conformal transformation, statement and interpretation of Maxwell's equations.

Steady Magnetic Fields: Lorentz force equation, concept of magnetic intensity and magnetic field, Biot-Savart Law, magnetic vector potential, force and torque between the current carrying conductors, loops, solenoid, magnetic, magnetic dipole M vector, Calculation of inductance for simple geometries, energy stored in a magnetic field, solution of magnetic static problems by separation of variables, field mapping and conformal transformation, magnetic circuits, statement and interpretation of Maxwell's equations.

Time Dependent Fields: Generalization of Maxwell's equation in source free medium, plane waves and plane wave reflections at conductor and dielectric interfaces, wave propagation in conducting and dielectric media, concept of surface impedance and skin effects.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

Examination Theory

11P

Paper III EC 213 Network Analysis and Synthesis

31G

- (1) *State-Variable analysis of circuits:* formulation of state equations for networks and their solution.
- (2) *Passive networks Synthesis:* Properties of driving point and transfer functions of passive networks, positive real functions, Synthesis of RC, RL and LC driving point functions; minimum functions and their synthesis, Two-port synthesis (ladder networks).
- (3) *Active network Synthesis:* Active elements (impedance converter and inverters). Pathological elements (nullator, norator, nullor) and their use in realising controlled sources and other active elements. Active synthesis of driving point impedances and transfer functions, sensitivity considerations.
- (4) *Analysis of Switched-capacitor networks:* Switched capacitor resistor equivalence, analysis of circuits containing switched capacitors.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

Examination Theory

11P

Paper IV EC 214 Digital Circuits & Systems I

31G

(Same as COE 214)

Introduction to logic families—RTL, DTL, TTL, ECL, IIL, EMOS etc. Logic gates, Boolean algebra, Combinatorial Logic, Karnaugh Map Techniques, Q.M. Techniques, Combinatorial Logic, Binary number representation, Binary arithmetic, Binary Codes, Half adder, Full adder, Transistorised Bistable, Astable, Monostable multivibrators, Schmidt trigger, Flip-Flops, Latch, Clocked Flip-Flop, TTL Clock generator. Monostable multivibrator and Astable multivibrator. Introduction to Counters, Ripple Counters, Synchronous counters, Programmed counters, Design of Counters, decoders, multiplexers and code converters.

Digital to analog conversion: Analog to Digital Conversion, Voltage to frequency conversion, Frequency to voltage conversion, Design of Display Systems.

Semiconductor Memories, PLAs

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

<i>Examination Theory</i>	LTP
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<i>Paper V EC 215 Electrical Machines II</i>	310
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Poly Phase Induction Motors: General constructional features, types of motors, rotating magnetic field, production of torque, slip, equivalent circuit, phasor diagram, torque equation, torque-slip characteristics: effect of rotor resistance, brief idea of double cage and deep bar rotor motor, automatic push button and other types of starters, brief idea about thyristorised speed control of Induction motor (i.e. v/f control only) speed control applications.

Synchronous Machines: Brief construction details of three phase synchronous generators, emf equation principle of operation of synchronous motor, power factor correction.

Single Phase Induction Motors: Construction, principle of operation, classification based on starting methods shaded pole, split phase and capacitor motors, speed control, special Machines, single phase a.c. series motors, universal motor, repulsion motor, reluctance motor, machines for control applications, tacho generators, Servo motors, Synchro-transmitter and receiver, printed circuit motor, stepper motor.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

<i>Examination Practical</i>	LTP
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<i>Paper I EC 216 Electronics II</i>	002
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Based on the course work corresponding to EC 211 Electronics II.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

<i>Examination Practical</i>	LTP
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<i>Paper II EC 217 Digital Circuits and Systems I</i>	002
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Based on course work corresponding to EC 214 Digital Circuits and Systems I.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

<i>Examination Practical</i>	LTP
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<i>Paper III EC 218 Electrical Machines II</i>	002
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Based on the course work corresponding to EC 215 Electrical Machines II.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

Examination Practical

Paper IV EC 219 Electronic Workshop and Electrical Drawing

Electrical Wiring: Types of electrical wiring for industrial and domestic installation, their comparative features, material employed, exercises in following type of domestic wiring—conduit, cleat, casing capping and TRS on batters, exercises in hospital, godown and staircase wiring testing of installation according to Indian Electricity rules.

Winding of Electrical Machines: Materials employed for winding of electrical machines, enamelled wires, cotton covered and silk covered wire; bar conductors, simple lap and wave winding for d.c. machines, single layer and double A.C. winding, fault location in windings and d.c. armature testing of electrical machines according to ISI standards.

Electrical Circuit Drawing: Study of ISI abbreviations and symbols for electrical equipment in electrical drawings, lay-out and circuit diagram for domestic, industrial lighting and power schemes, energy meter connections, circuit diagrams for different a.c. and d.c. starters, layout of a typical distribution, substation.

Electrical Machines: Detailed dimensioned drawings from sketches of components of rotating electrical machines, such as armature, commutator, fieldmagnet frame, poles and shoes etc: details of transformers transmission line pole, crossarm, and insulators

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

Examination Sessional/Viva

Paper I EC 220 Practical training

Training undergone for 20 days in the College workshop at the end of III semester.

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

Examination Sessional

Paper II EC 221 Report Writing

Report writing (Sessional)

LTP

002

B.E. (Electronics & Comm. Engg.) II Yr. IV Sem.

Examination Sessional	LTP
Paper III EC 222 Programming II	002
Based on Numerical methods.	

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

Examination Theory	LTP
Paper I EC 301 Transmission Lines and Wave Guides	310

Transmission Lines: Transmission Line equation, characteristic impedance, propagation constant, attenuation and phase constant, computation of primary and secondary constants, line distortion, Loading of line, artificial lines, delay lines, reflection coefficient, V.S.W.R., reflection loss, efficiency of transmission, U.H.F. Lines-Smith chart, Quarter wave transformer, single and double stub matching. U.H.F., lines as circuit elements, Equalizers-classification, inverse networks, Lattice and Bridge T attenuator equalizers phase equalizer, Attenuator-Symmetrical and asymmetrical, Bridge T and Ladder attenuator variable attenuator.

Wave Guide: Rectangular cylindrical wave guide Solution of wave equation, modes, propagation properties, power transmission, power losses in wave guide, choice of dimensions and material, Excitation of modes.

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

Examination Theory	LTP
Paper II EC 302 Control Engineering	310

Mathematical Model: Transfer function concept, derivation of transfer function of physical systems, concept of feedback and its effect on the performance of a system, block diagram reduction, Signal flow graphs.

Transient Response Analysis: Standard inputs, response of first and second order systems, derivative and integral action, static and dynamic order coefficients.

Root Locus Techniques: Root locus plot, general rules for constructing root loci, root locus analysis of control systems.

Frequency Response Methods: Logarithmic plots, experimental deter-

mination of transfer functions, Polar plot, Log magnitude versus phase plot, MN Loci, Nichol's chart.

Stability: Concept of stability, Routh-Hurwitz stability criterion, Nyquist stability criterion, relative stability analysis.

Control Components: Synchro, D.C. Motor, Tachogenerators, gyroscope, amplifiers, Magnetic, amplifiers.

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

<i>Examination Theory</i>	LTP
<i>Paper III EC 303 Computer Systems & Organisation</i>	310
<i>(Same as COE 303)</i>	

Basic concepts of structure of computers: Addressing methods, Machine program sequencing, Memory organisation Addresses and encoding of information, instruction formats, Instruction sequencing, Execution of a complete instruction, Address modes, Push down stacks, subroutines, Instruction set of a typical processor; instruction set in a large computer, Stack computers Sequencing of control signals, Microprogrammed control, Input/output organisation, addressing I/O devices, I/O Devices, I/O programming, data transfer, Synchronisation, interrupt handling, I/O channels.

Introduction to assembler, Linker, Loader.

Microprogramming: Basic notion, implementation strategies, case study and high level language implementation.

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

<i>Examination Theory</i>	LTP
<i>Paper IV EC 304 Linear Integrated Circuits</i>	310
<i>(Same as COB 304)</i>	

IC OP-AMP applications: OP-AMP fundamentals (brief review of differential amplifier, current mirror, active load, level shifter, output stage; ac and dc characteristics) basic building blocks using OP-AMPS, inverting/noninverting VCVS, integrators, differentiators, CCVS and VCCS, Instrumentation amplifiers, Biquad filter (LP, HP, BP and notch), oscillators.

Logarithmic amplifiers, Log/Antilog modules, precision rectifier, peak detector, sample and hold circuits.

OP-AMP as comparator, Schmitt Trigger, square and triangular wave generator, monostable multivibrator.

IC Analog multiplier applications.

IC OTA applications: basic building blocks using OTA, electronically programmable functional circuit examples.

Voltage regulators: OP-AMP regulators, IC regulators fixed voltage regulators (78/79, XX), 723 IC regulators (current limiting, current fold back); SMPS. IC Timer applications: monostable and astable operation.

IC Phase lock loop applications,

Applications of analog switches: Programmable gain amplifiers.

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

Examination Theory

LTP

Paper II EC 305 Industrial Organization and Managerial Economics 310
(Same as IC 305 and COE 305)

Principles of Management: General ideas on the art and science of management, various functions. Definition and scope of Engineering.

Organisation Structure: Various types, their merits and demerits.

Plant Location and Layout: Factors affecting plant location. Various types of plant layout.

Production Planning and Control: Sequence of planning and control of production: Scheduling routing, despatching.

Method Study: Methods analysis, various charts associated with methods analysis, time study : methods of rating.

General Idea of Personnel Management: Industrial psychology, job evaluation and monitoring.

Business decision making and forward planning, Demand and demand forecasting, cost of production analysis-prices and pricing decisions-Profit and Capital Management.

Analysis of inter-industry relations, Macro-economics and Business (with special reference to India).

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

Examination Practical LTP

Paper I EC 306 Computer Systems Organisation 002

Based on course work corresponding to EC 303

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

Examination Practical LTP

Paper II EC 307 Linear Integrated Circuits 002

Based on Course work corresponding to EC 304

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

Examination Practical LTP

Paper III EC 308 Control Engineering 002

Based on course work corresponding to EC 302

B.E. (Electronics & Comm. Engg.) III Yr. V Sem.

Examination Sessional LTP

Paper II EC 309 Programming III 002

PASCAL Language:

Number and character representation; Identifiers; Declaration; Syntax charts; Expressions, Assignment Statement, Input-Output statements, Control statements i.e., GOTO, WHILE, REPEAT FOR IF CASE, DATA TYPE ARRAYS. Procedure and Functions, More Data types, files. Applications of Pascal including development of programmes for scientific and Engineering problems using the above features.

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Theory LTP

Paper II EC 311 Microprocessors 310

(Same as COE 311)

Review of popular 8 bit microprocessors, study of architecture, instruction set and its peripheral support chips like DMAC, programmable interrupt controller, USART, peripheral interface chips.

Comparison with other popular 8 bit microprocessor chips.

Introduction to popular 15 bit microprocessor, architecture, addressing modes, instruction set, interfacing techniques, support chips.

Introduction to popular 32 bit microprocessor chips.

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Theory Examination LTP

Paper II EC 312 Communications Principles and Circuits 310

Review of parallel RLC circuits and transistor amplifiers.

General theory of amplified modulation, maximum allowable modulation, modulators and balance modulators S.S.B., Vestigial side band compatible single side band.

General theory of frequency modulation and phase modulation relation between phase and frequency modulation, Spectrum of an FM and PM signal. (NBFM & WBFM), FM generation-varactor diode and reactance circuit, Indirect method of FM generation.

AM detection, Envelope detector-analysis and circuit, different types of clipping, coherent detector, application of PLL in AM detection.

FM detection: rates & Fore Seely discriminator Application of PLL in FM detection, frequency compressor, L circuits.

RF amplifiers Tuned R.F. amplifiers, IF amplifiers analysis and circuit, stagger tuned RF amplifiers frequency convertors and mixers class C amplifiers, Neutralisation.

Radar Review—AM and FM review, principle of super hydrodyne.

Transmitter—AM and FM transmitters, Transmitter matching circuit, AFC. Class Amplifiers.

RF tuned voltage amplifiers.

Modulation and detection.

Mixers and Converters: Principles and circuits.

FM modulators: varactor diode and Reactance circuit, FM Modulations, generation of wide band FM by narrow band FM, FM transmitter block diagram.

FM demodulators: classical type, PLL, frequency compression FM demodulators.

Noise Considerations.

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Theory

LTP

Paper III EC 313 Antennas and Propagation

310

Radiation: Potential functions and wave equation, radiation from a point source, Hertzian dipole.

Cylindrical and Loop Antenna: Electrically short antenna, half wave dipole, monopole and folded dipole, loop antenna, parameters, broadcast antenna, Rhombic antenna, feeds, mutual coupling between two antennas, receiving antennas, Arrays. Principle of pattern multiplication, End-fire broadside, non-uniform arrays, Planar arrays, Radiation from Apertures; Hyghen's principle, concept of magnetic charges, open ended wave guides, horn, slot radiators, parabolic and lens antennas.

Wide Band Antennas: Helical, log periodic.

Propagation: Ground, Skywave, line of sight, troposcatter, duct-propagation.

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Theory

LTP

Paper IV EC 314 Bipolar and Mus Analog

310

Integrated Circuits:

- (1) Difference in design considerations for discrete and integrated electronic circuits; passive and components available in bipolar and MOS technology brief review of integrated NPN, PNP, lateral PNP, MOSFETS structures, characteristics models.
- (2) Basic building blocks of bipolar and MOS analog ICS: differential amplifier, current sources, current mirrors and current repeaters, voltage references, active loads, level shifters, output stages, voltage to current converters, differential to single ended converters.
- (3) IC op-amp architectures, bipolar op-amp (IC 741) and its DC and small signal ac analysis (voltage gain, Z_{in} , Z_o , GBP and slewrate): MOS op-amp architectures.
- (4) IC analog multipliers, Gilbert multiplier cell, (transconductance multiplier), quadrant multipliers.
- (5) IC operational transconductance amplifier (OTA), integrated Norton amplifier and other analog ICs.
- (6) CMOS-compatible analog circuits and recent trends.

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Theory

LTP

Paper V EC 315 Filter Design

310

Basic Concepts: Nature of filter specification, filter design process, transfer function and scaling.

Approximation Theory: Ideal low pass loss functions, linear phase function, band pass filter function.

Passive Filter with Lumped Elements: General two port reactance network, filter circuits, design of ladder networks, lattice network design and conditioning in filter design.

Crystal Ceramic filters and Mechanical Band Pass Filter.

Active filters with lumped and distributed R-C networks.

Preliminary considerations, sensitivity, single and multi loop feed back approaches, simulated inductance approach and FDNR approach to OP-AMP RC filter design. design of RC-RC active filters transversal RC network.

Elements of digital filters.

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Practical LTP

Paper I EC 316 Microprocessors 002

Based on the Course work corresponding to EC 311

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Practical LTP

Paper II EC 317 Communication Principles and Circuits 002

Based on course work corresponding to EC 312

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Practical LTP

Paper II EC 318 Bipolar and MOS Analog Integrated Circuits 002

Based on the Course work corresponding to EC 314

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Sessional LTP

Paper II EC 319 Programming IV 002

C- Language

B.E. (Electronics & Comm. Engg.) III Yr. VI Sem.

Examination Sessional/Viva LTP

Paper II EC 320 Practical Training 000

Based on the practical training in Electrical/Electronic Workshop

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Theory

LTP

Paper I EC 401 Microwave Engg.

310

Survey of Microwaves: Introduction, Comparison between Transmission lines and waveguides, transmission-Time Effect, Advantages of Microwave Regions, Basic Problems.

Components & Elements: Joints, Bends, Irises, Posts and screws, Cavity Resonators, Hybrid couplers, Isolator, attenuator, frequency meter, Short-circuit Plynger, Phase shifter, S-parameters.

Microwave Tubes: Klystron Amplifier, Reflex-Klystron, Magretron TWT, CFA, Gyrotrons, Microwave Ovens.

M/W Solid-State Devices & MICS: M/W Bipolar Transistor, FETS, Varactor and Step-Recovery Diodes, parametric Amplifiers, Tunnel Diode, Gunn diode, Read Diode, Impatt, Trapatt, Baritt, Pin Diode, Schottky Diode, Backward Diode, introduction to MICs, Stripline and Microstrips, Fabrication of MICs etc., MASERS and LASERS.

Introduction to Microwave Detectors, Mixers Switches, Microwave Measurements.

Microwave filters

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Theory

LTP

Paper II EC 402 Digital Circuits and Systems II

310

(Same as COE 402)

Review of Sequential circuits, State Tables and State diagrams, State assignment, Designing digital systems with State diagrams, Designing of digital circuits with the help of a Hardware programming language, variable machine cycle and fixel cycle length machine, Design of an 8 bit processor, Introduction to Design of a Computer.

Introduction to PAL Devices.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.**Examination Theory****LTP****Paper III EC 403 Communication Systems****310**

Transmission Through Electronic Networks: Spectra of periodic and non-periodic signals transmission through linear networks, impulse response and transfer function, response of idealised networks, distortionless transmission.

Random Signal Theory: Introduction to probability, joint and conditional probability, random variables, frequency function, probability density function, CDF; moments; transformation, Ergodic process, correlation function, spectral densities.

Noise: Types of noise, noise figure, noise temperature, equivalent noise bandwidth.

Pulse Modulation: Sampling theorem, P.A.M., P.D.M., P.P.M., P.C.M., D.M. modulation and detection, techniques, S/N ratio, comparison with analog systems, phase locked loop.

Information Transmission: Measure of information, channel capacity entropy, conditional entropy, redundancy, coding, exchange of bandwidth with S/N ratio.

Elements of Digital Communication: Networks with random inputs, matched filter, ASK, PSK, FSK.

Elements of Detection Theory.

B.E. (Electronics & Comm. Engg.) VI Yr. VII Sem.**Examination Theory****LTP****Paper IV & V EC 404 & EC 405 Electives & II****310****Digital Signal Processing I**

Z Transform Inverse Z transform, Solution of difference equation.

Stability analysis analysis in Z-Plane.

Introduction of Digital Signal Processing.

Review of different types of analog filter-systems

One dimensional digital Filter, finite Impulse response filter and infinite impulse response filter.

Discrete Fourier transform, Fast Fourier Transform, Introduction to Digital Image Processing.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Theory LTP

Paper IV and V 404 and EC 405 Electives I and II 310

Biomedical Electronics

Basic Neurology, activity of heart, Neuromuscular systems. Electrical activities of the visual system. Auditory system mechanism, Noise and interference in biological signals. Computer application.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Theory LTP

Paper IV and V EC 404 and EC 405 Electives I and II 310

Satellite Communication

General principles of Satellite Communication, Energy consideration, Active and Passive Satellites, Global Satellite Communication, Ground to-space, space to-space communication. Transponders design system. Design of typical satellite communication system.

Environmental and noise consideration, Topics of current interest.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Theory LTP

Paper IV and V EC 404 and EC 405 Electives I and II 310

Advanced Electronic Devices

Review of Semiconductor Physics, Shockley-Read-Hall Statistics, Ideal MOS Devices; Structure, the energy band diagram, Accumulation, Depletion; Weak & Strong Inversion, exact solution of Poisson's equation, Depletion Approximation, Quasistatic CV measurement, High Frequency CV Measurement, Deep-Depletion Analysis.

Deviations from Ideal MOS. Metal Semiconductor Work function difference. fixed Oxide Charge, Interfacial Traps, Gated Diode.

MOS Field Effect transistors. Qualitative Theory of Operation Effective Mobility, General Analysis, Square Law theory. Bulk Charge Theory, threshold, Terminology and Technology, threshold adjustment, Back Biasing, Short Channel Effects.

Circuit Aspects, NMOS inverter Circuits, Switching Characteristics, CMOS Inverter and Switching Performance, Dynamic Vs. Static Logic, Static & Dynamic Memory Cells and Architectures.

Fabrication Principles. Wafer Processing, Oxidation Lithography Selective Diffusion, Ion Implantation. Metallization, Dry & Wet Etching. NMOS IC Technology, CMOS Technologies, Layout Principles.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

<i>Examination Theory</i>	LTP
<i>Paper IV and V EC 404 and EC 405 Electives I and II</i>	310
<i>Optical Fibres</i>	

Optical fibre, preparation and types, optical fibres as wave guides, Ray optics and electromagnetic theory, optical wave propagation properties.

Joining, Connectors and couplers, sources, lasers, LEDS, detectors, PIN diodes, APD, Applications to communication and instrumentation.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

<i>Examination Theory</i>	LTP
<i>Paper IV and V EC 404 and EC 405 Electives I and II</i>	310
<i>Power Electronics</i>	

Review of electron devices, controlled rectifiers and inverters, Harmonic analysis, input power factor control, Adjustable frequency inverters, voltage source inverters, current source inverters, communication circuits, pulse width modulation, harmonic reduction in inverter, choppers, cycloconverters, High power factor operation of variable voltage controller uninterrupted power supply (UPS).

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

<i>Examination Theory</i>	LTP
<i>Paper IV and V EC 404 and EC 405 Electives I and II</i>	310
<i>Switching and Automata</i>	

Some Special Switching Functions: Symmetric, functions, liners functions, Unate functions and threshold functions.

Sequential Machines: Finite state sequential machines, classifications of states, submachines, strongly connected machine, Mealy and Moore modles and transition matrix.

Flow table minimization of completely and incompletely specified machines, State assignments, series and paralled decompositions circuit realisation Introduction to asynchronous sequential machines and to Linear sequential machines.

Automata and Regular Expression: Deterministic finite automata, non deterministic finite automata. Equivalence of deterministic and nondeterministic automata, properties of languages accepted by automata.

Introduction to regular expression, its relation with finite automata. Introduction to context free grammars and languages.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

<i>Examination Theory</i>	LTP
<i>Paper IV and V EC 404 and EC 405 Electives I and II</i>	310
<i>Computer-Aided Design</i>	

- 1. Introduction to CAD:* Introduction to interactive computing and use of graphics, Requirements of interactive computing, dedicated Vs time-sharing modes, Interactive interface, CRT as display device, Graphical quality, capacity, speed of modification, ease of programming, line drawing, solid-area, graphics and three-dimensional (Tektronix 4051, IBM 5100, Graphics packages 9GI406 GHIOM and others. Use of interactive input tools such as light pen, cursor geometry of plotting in two dimensions scaling.
- 2. Computer-Aided Circuit Design:* Topological structures, computer

methods of linear and non-linear network analysis, sensitivity models for computer-aided design of filters, printed and integrated circuits, computer-aided probabilistic network synthesis.

3. Introduction to computer-aided design of control systems.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Theory LTP

Paper IV and V EC 404 and EC 405 Electives I and II 310

Microprocessor Applications

Introduction to Advance Microprocessors, Coprocessor, Various Bus Standards, Precautions about shielding, Grounding etc. Bus Interconnections, Memory System Design, DMA Controller, Design of serial and parallel Interfaces. Design of Tape, CRT, Printer, Floppy and Disk Controllers, Design of Input-output Controller, Communication interface and protocol controllers.

Writing a Monitor Program.

Introduction to Bit Slice Processor, Signal Processing Processors Development Tools:

MDS, Logic Analyzer, Signature Analyzer.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Practical LTP

Paper I EC 406 Microwave Engineering 002

Based on the course work corresponding to EC 401

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Practical LTP

Paper II EC 407 Digital Circuits and System II 002

Based on the course work Corresponding to EC 402

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Practical LTP

Paper III EC 408 Communication Systems 002

Passed on the Course Work Corresponding to EC 403

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Practical

Paper IV EC 409 Practical Training

Based on Training Undergone at the end of Sixth Semester.

B.E. (Electronics & Comm. Engg.) IV Yr. VII Sem.

Examination Sessional

LTP

Paper I EC 410 Programming V

002

Systems Programming Languages

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory

LTP

Paper I EC 411 Consumer Electronics

410

(Same as IC 411)

Hi-Fi audio systems, stereophonic sound systems, public address systems, acoustics, quadrophonic sound systems, graphic equalizers, electronic tuning, dolby noise reduction, speech synthesizers.

Video systems—BW TV, Colour TV and WDTV systems, Video Camera, Video monitoring, electronic cameras.

Recording System—Audio, Video recording media and systems, compact disc systems, digital and analog recording, principles of high density recording, VCR, VCPs, Memory diskettes, disks and drums.

Switching systems for telephone exchanges PABX, EPBX, Modular telephones, telephone message recording concepts, remote controlled system.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory

LTP

Paper II and III EC 412 and EC 413

410

Electives III and IV

Introduction to VLSI Design

Evolution of VLSI, MOS Devices and Circuits, MOS Transistors—

Depletion and Enhancement mode transistors. Transistors as a Switch, NMOS inverter, inverter delay, Parasitic effects Pull up/Pull-down ratios for inverting logic. Basic NAND, NOR, XOR, and XNOR gates, multiplexers, Memory, bars transistors, super buffers, NMOS combinational Network with bars transistors and inverters, PLAs, clocked logic, two-phase clock, register stage, Introduction to CMOS gates.

Processing Technology, Explanation of different stages in fabrication.

Design Methodology, Steps in the Design of a VLSI part, VLSI design tools.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory

LTP

Paper II and III EC 412 and EC 413

410

Electives III and IV

Modern Control Theory

State variable modelling to continuous-time and discrete-time systems, Linearization of state equations, solutions of state equations of linear time-invariant and time varying systems, controllability and observability of dynamical systems, Minimal realization of linear systems and canonical forms, Liapunov stability theory.

Classification of nonlinear phenomena, Linear and piecewise approximations, phase-plane, describing function and quasilinearisation techniques, Perturbation methods, Popov's criterion; introduction to functional analysis techniques of stability of nonlinear systems.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory

LTP

Paper II and III EC 412 and EC 413 Electives III and IV

410

Digital Signal Processing II

Spectrum Analysis and FFT: Radix-2 FFT, unified approach to FFT, spectrum analysis using FFT Relation of Hopping FFT, to Filter Banks, windows in spectrum analysis using FFT. Relation of Hooping FFT to Filter Sanks, windows in spectrum analysis, measurement of spectrum Bluestein's

algorithm, the Chirp-z transform algorithm, convolution and correlation using number theoretic transforms.

Two Dimensional Signal Processing: Two dimensional signals systems, frequency domain techniques, two-dimensional z transforms, two dimensional DFT, and FIR filters, frequency sampling filters, Examples of picture processing.

Applications of Digital Signal Processing to Speech and Radar: Model of Speech production, channel vocoder analyzers and synthesizers, voiced-unvoiced (Buzz-Hiss) detection, homo-morphic processing of speech, formant synthesis, Linear prediction of speech; digital matched filters for radar signals, Long range demonstration radar (LRDR).

Special Purpose Hardware for Signal Processing: Direct form and cascade form IIR filters, multiplexing, digital touch-tone receiver (TTR), TDM to FDM translator, hardware realization of digital frequency synthesier, FFT indexing, an optimum radix-2 hardware structure, comparison of radix-2 and 4 pipeline, FFT, 10 MHz pipeline convolver.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory

LTP

Paper II and III EC 412 and EC 413 Electives III and IV

410

Operating Systems

Basic concepts and Terminology, General Design considerations I/O programming, interrupt programming and machine structure Memory Management single continuous allocation, multiprogramming Partitional allocations, Relectable Partitioned Memory Management Paged Memory Management Future trends in memory management.

Processor Management state model, job scheduling, processor scheduling, multiprocessors systems, process synchronization.

Device Management, Techniques for device management Hardware considerations, controls units, Virtual Devices, Future trends.

Information Management: A simple file system, General model of a file system, symbolic file system Basic file system, Access control verifica-

tion, logical file system, Physical file system, Allocation and Device strategy Module, Trends in information Management. Design of a sample operating system and case studies.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory LTP

Paper II and III EC 412 and EC 413 Electives III and IV 410

Computer Software Engineering

Assembler, Loader, Bootstrap, Linking, Overlays, Programming Language and Formal Systems, Compilers Operating Systems.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory LTP

Paper II and III EC 412 and EC 413 Electives III and IV 410

Computer Communications and Electronic Switching

Elements of computer network, Evolution of data networks, example of network, Circuit, message, and packet switching. Network design, capacity assignment in networks, topological design. Terminal layout problems, William algorithm, Kruskal algorithm, Multiple access schemes for packet communication—FDMA, TDMA, CDMA Random access techniques ALOHA, slotted ALOHA, CSMA transmission protocols and systems assumptions, Queuing theory, Routing and flow control, slotted ALOHA satellite communications systems, Design of buffers, model description and analysis S-ALOHA with an intelligent satellite, protocols and implementation, system examples, Analysis and performance evolution of computer networks.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory LTP

Paper II and III EC 412 and EC 413 Electives III and IV 410

Laser Communication

Fundamentals of Lasers: Energy levels, Emission and Absorption. Spontaneous and Stimulated radiations, Population inversion. Threshold condition for Laser action: Resonators, Mirrors, Transverse and Axial Modes.

Laser Sources: Solid state Lasers-Ruby, Neodymium and Semiconductor, Gas Lasers-Helium, Non-Helium Cadmium, Argon, Krypton, Carbondioxide Dye Lasers.

Laser Light Properties: Spectral line Width, Coherence-Time and Spatial Directionally, Focussing Roman spectroscopy.

Laser Output Controls: Electronic effects-Kerr, Pockel and Faraday Q-switching-mechanical electrophysical photochemical Deflection of Laser output—electrophysical and acoustical deflectors, frequency stability mode locking.

Laser Modulations: Internal modulations at source and External Modulation; mechanical modulation Acoustic modulation. Amplitude modulation, electro-optic modulation.

Transmission: Elements of Fibres optics, Light pipes, fibreends, implications. Direct and Heterodyne detection. Laser propagation through atmosphere.

Holography: Elements of holography, Image magnification, Resolution and Aberration Application of holography in acoustic holography, Data storage, character recognition etc.

B.E. (Electronics & Comm. Engg.) IV Yr VIII Sem.

Examination Theory LTP

Paper II and III EC 412 and EC 413 410

Electives III and IV

Rad. Systems:

Introduction: Radar block diagram and operation, applications of radar.

Radar Equations: S/N ratio, radar cross-section of targets, PRF and range ambiguities system losses.

and Frequency Modulated Radar: MTI and pulse dopplar tracking examples—tracking radar.

Radar transmitters and Receivers: Amplitron and stabilatron modulators, superheterodyne receiver, Noise figure, effective noise temperature, Duplexers, Antennas and pattern synthesis.

Detection of Radar Signal and Extraction of Information: MF receivers, detection criteria, detector characteristics, statistical estimation of parameters, range and Doppler velocity measurements pulse compression.

Introduction to Clutter and Interference: Ground clutter sea clutter, echo visibility of targets in weather clutter interference, ECM, ECCM.

System Engineering and Design: Radar parameter selection aircraft surveillance radar—an example, airborne weather-avoidance radar, radar detection of extra terrestrial objects detection and tracking of earth satellites and space vehicles.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory LTP

Paper II and III EC 412 and EC 413 410

Electives III and IV

Computer Oriented Optimization Techniques

Optimization problems, Search techniques and gradient methods for unconstrained optimisation Linear methods for unconstrained optimization Linear and integer programming Kuhn-Tucker, Direct and transformation methods for non-linear programming Multi-objective programming. Dynamic programming. Applications.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Theory LTP

Paper II and III EC 412 and EC 413 410

Electives III and IV

Fault-Tolerant Computing

1. **Basic Concepts of Reliability:** Reliability and the failure rate, MTBF, Maintainability, availability, Series and-Parallel Systems.
2. **Faults in Digital Circuits:** Modelling of faults, stuck-at-faults, Bridging fault etc.
3. **Test Generation for Combinational Logic Circuits:** Path Sensitization technique, D-Algorithm, Boolean Difference, PODEM, Multiple fault detection.
4. **Test Generation for Sequential Circuits:** State identification

experiments, machine identification, checking experiments, Augmented sequential machine and easily testable machines and fault diagnosis.

5. Fault-Tolerant Design of Digital Systems: Basic concepts, Triple Modular Redundancy, use of error correcting codes, Fault-Tolerant electronic telephone exchanges and computers.
6. Basic concepts of Random testing, Transition count testing, signature analysis, self checking and fail-safe logic.
7. Fault detection in RAM and microprocessor.
8. Design for Testability: Controllability and Observability, Introductory concepts of Reed-Muller expansion technique, Level sensitive Scan Design (LSD) and Built-in Digital Circuit observer (BIDCO).

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Practical LTP

Paper I EC 414 Elective III and IV 002

Based on the course work corresponding to EC 412 and EC 413.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Practical/Viva LTP

Paper II EC 415 Project 010

Based on the project assigned to the student involving investigations, design, development, fabrication etc.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Practical/Viva

Paper III EC 416 Practical Training

Based on the training taken in the industry.

B.E. (Electronics & Comm. Engg.) IV Yr. VIII Sem.

Examination Sessional LTP

Paper I EC 417 Seminar and Reports 020