



**MODIFIED CBCS CURRICULUM OF
M.Sc. ELECTRONICS AND COMMUNICATIONS
PROGRAMME**

SUBJECT CODE = ELC

FOR POST GRADUATE COURSES UNDER RANCHI UNIVERSITY

A Self-financed Vocational Course



Implemented w.e.f.
Academic Session 2019-2021



RANCHI UNIVERSITY, RANCHI



Proposed Syllabus

of

M. Sc. (ELECTRONICS AND COMMUNICATIONS)

A Self-financed Vocational Course

Under Choice Based Credit System (CBCS)

From

Academic Session 2019-2021

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COURSE STRUCTURE FOR M.Sc. ELECTRONICS AND COMMUNICATION

Table AI-1: Distribution of 80 Credits for Subjects having Practical Papers

[*wherever there is a practical examination there will be no tutorial and vice-versa.]

Course	Papers	Credits Theory + Practical	Credits Theory + Tutorial
I. Foundation Course (FC)			
1. Foundation Course Compulsory Foundation/ Elective Foundation	(FC) 1 Paper	1X5=5	1X5=5
II. Core Course (CC)			
Theory	(CC 1 to 10/11) 7 Papers/11 Papers	7X5=35	11X5=55
Practical/ Tutorial*	3 Papers/-----	3X5=15	
Project	1 Paper	1X5=5	1X5=5
III. Elective Course (EC)			
A. Ability Enhancement Course of the Core Course opted	(AE/EC 1) 1 Paper	1X5=5	1X5=5
B. Discipline Centric Elective Theory + Practical	(DC/EC 2&3) 2 Papers 1 Paper	2X5=10 1x5=5	
OR Theory/Practical/Tutorial*	1Paper + 1 Practical/Dissertation		2X5=10
OR Generic Elective/ Interdisciplinary (GE/EC 2&3)			
Theory OR	2 Papers		
Theory/Practical/Tutorial*	1 Paper + 1 Practical/Dissertation		
Total Credit = 80			= 80

Table AI-1.1: Course structure for M.Sc Programme with Practical Papers

Semester	Subject (Core Courses) 11 Papers	Allied (Elective Courses) 4 Papers	Foundation Course (Compulsory Course) 1 Paper	Total Credits
Sem-I	C-1, C-2, C-3 (5+5+5=15 Credits)		Foundation Course FC (05 Credits)	20 Credits
Sem-II	C-4, C-5, C-6, C-7 (5+5+5+5=20 Credits)			20 Credits
Sem-III	C-8, C-9, C-10 (5+5+5=15 Credits)	EC1 (05 Credits)		20 Credits
Sem-IV	C-11 (Project) (05 Credits)	EC2, EC3, EP (5+5+5=15Credits)		20 Credits
Total = 80 Credits				

Table AI-2 Subject Combinations allowed for M. Sc. Programme (80 Credits)

Foundation Course FC 1 Paper	Core Subject CC 11 Papers	Ability Enhancement Course AE 1 Paper	Discipline Centric Elective/ Generic Elective Course DC/ GE/ EC 3 Papers
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Table AI-2.1 Semester wise Examination Structure for Mid Sem & End Sem Examinations:

Sem	Core, SE/ GE/ DC/ EC & Compulsory FC Courses				Examination Structure		
	Paper	Paper Code	Credit	Name of Paper	Mid Semester Evaluation (F.M.)	End Semester Evaluation (F.M.)	End Semester Practical/ Viva (F.M.)
I	Foundation Course	FCELC101	5	Programming in C/C++	30	70	----
	Core Course	CCELC102	5	Quantum Theory & its application	30	70	----
	Core Course	CCELC103	5	Semiconductor Devices	30	70	----
	Practical's on Core	CPELC104	5	Practical-I (Semiconductor Devices Lab)	----	----	70 + 30
II	Core Course	CCELC201	5	Instrumentation and Measurements	30	70	----
	Core Course	CCELC202	5	Digital Electronics, Microprocessor and Microcontroller	30	70	----
	Core Course	CCELC203	5	Electromagnetic Theory and Optical communication	30	70	----
	Practical's on Core	CPELC204	5	Practical-II (Digital Electronics, Microprocessor & Microcontroller lab)	----	----	70 + 30
III	Ability Enhancement Course	CCELC301	5	Industrial Electronics	30	70	----
	Core Course	CCELC302	5	Communication Circuits and Control System	30	70	----
	Core Course	CCELC303	5	Digital Signal Processing & its Application	30	70	----
	Practical's on Core	CPELC304	5	Practical-III (Communication & Control System Lab)	----	----	70 + 30
IV	Elective	ECELC401	5	Computer Networking & Data Communication	30	70	----
	Elective	ECELC402	5	VLSI Design and Embedded System	30	70	----
	Practical's on Elective	EPELC403	5	Practical-IV (Elective Paper Lab)	----	----	70 + 30
	PROJECT	PRPHY404	5	Project Work/Dissertation	----	----	70 + 30

CBCS	Choice Based Credit System
FC	Foundation Course
CC	Core Course
EC	Elective Course
ELC	Electronics and Communication
L	Lecture
T	Tutorial
P	Practical
SIA	Semester Internal Assessment
MSE	Mid-semester Examination
ESE	End-semester Examination
PR	Project/Dissertation

Explanations:

- One Lecture/Tutorial is of 1 hour duration.
- One Practical Session is of 2 hours duration and is equivalent to One Lecture/Tutorial of 1 Hour duration.
- Internal Examination:**
30 marks in each paper, except the Lab paper and Dissertation paper, is for Semester Internal Assessment and has a break-up of 20 (mid-semester examination) + 05 (Attendance/ regular interaction) + 05 (Seminar/ assignment).
- Mid-semester examination:**
Mid-semester examination (Theory) is of 20 marks. There will be two mid-semester examination of 20 marks each. "**Better of Two**" shall be applicable for computation of marks for SIA (Semester Internal Assessment).
- Paper FCELC101 and CCELC303 will have no theory mid-sem examination, but there will be a practical session assessment of 30 marks. In this paper break-up of 20 (mid-semester examination) + 05 (Attendance/ regular interaction) + 05 (Seminar/ assignment) will not be applicable.
- Pass marks in Mid-semester examination = 17; Pass marks in End semester examination = 28
- Mid Semester Examination (MSE):
*There will be two groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.*
- End Semester Examination (ESE):
*There will be two groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.*
Note: There may be subdivisions in each question asked in Theory Examinations
- Marking scheme for attendance**
(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).
- 10. Project/Dissertation:**
Each student shall have to complete a project work on any topic of his/her choice, but relevant to the frontier area of Electronics and Communication, or on a topic allotted by his/her project Guide/Supervisor/Department in Semester IV. This is compulsory and the candidate shall ensure that his/her project is on a relevant topic completed by him/her independently with the supervisory help and inputs from the concerned Guide/Supervisor. Other guidelines pertaining to this paper shall be provided by the Department.

SEMESTER I

4 Papers**Total 100 x 4 = 400 Marks****I. COMPULSORY FOUNDATION COURSE [FCELC101]:**

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 30Th. 3Hr) + 70 (ESE: 3Hrs)=100**Pass Marks (MSE:17 + ESE:28)=45*****Instruction to Question Setter:******Mid Semester Examination (MSE):******Mid-semester examination consisting of 30 marks will be set as lab exercises to assess the skill developed in this paper.******End Semester Examination (ESE):******There will be two groups of questions. Group A is compulsory and will contain two questions. Question No.1 will be very short answer type consisting of five questions of 1 mark each. Question No.2 will be short answer type of 5 marks. Group B will contain descriptive type six questions of fifteen marks each, out of which any four are to be answered.******Note:*** There may be subdivisions in each question asked in Theory Examinations***The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "Better of Two" shall be applicable for computation of marks for SIA.******(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).*****PROGRAMMING IN C/C++****Theory: 60 Hours; Tutorial: 15 Hours****Operating Systems**

Fundamental of operating systems, Idea of MS-DOS, GUI and Windows.

Introduction to Unix, File systems, Directories, Permissions and Directory hierarchy Shell, Shell commands, Variables, Looping, Filters, Grep family, sed, awk, shell programming, Programming with standard IO, Unix systems call, Low level I/O, Files system developments, Inodes program development, Document preparation, Nroff, Troff applications. **20 Lectures****Programming in C++****Introduction:** Introduction to programming in C++, Parts of a simple C++ program, Variables and Constants, Expressions and Statements, Functions, Looping and other and program flow.**10 Lectures****Classes:** Classes and members, Objects, Accessing Class members, Private and Public members, Constructors and Destructors, Member Functions, Inline implementations, Classes with other classes as members data. **08 Lectures****Memory Management:** Pointers, Manipulating data using pointers, the Stack and the Free store, Reference, Passing function arguments by reference, Returning values by reference, Advanced reference and pointers. **07 Lectures**

Function overloading and Operator overloading: Arrays, Multi-dimensional arrays, char Arrays, String classes. **05 Lectures**

Inheritance and Polymorphism: Overriding functions, Special classes and functions, The preprocessor. **05 Lectures**

Object oriented Programming: Analysis and Design, Encapsulation, Data hiding Inheritance, Polymorphism, Templates. **05 Lectures**

Laboratory exercises **15 sessions**

Programming examples in C⁺⁺. List of programs supplied is to be completed.

Books Suggested:

- Kernighan and Pike, "The UNIX programming Environment".
 - Lafore, R., "Object Oriented Programming in Turbo C⁺⁺" Galgotia Publication, New Delhi.
 - Balguruswami, E., "Object Oriented Programming in C⁺⁺", Tata Mc Graw Hill Pub., New Delhi 1995.
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II. CORE COURSE [CCELC102]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100**Pass Marks (MSE:17 + ESE:28)=45****Instruction to Question Setter:****Mid Semester Examination (MSE):**

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "**Better of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).

QUANTUM THEORY & ITS APPLICATION**Theory: 60 Hours; Tutorial: 15 Hours**

Introduction: Laws and concepts of Classical physics, origin of quantum mechanics, inadequacies of classical physics, blackbody radiation, stability of atom, emission of line spectra, photo-electric effect, etc, New ideas: discreteness of energy, wave-particle duality **15 lectures**

Mathematical preliminaries: Concepts of operator, linear operator, Hermitian operators and their properties, theorems on operators, examples, concepts of wave function and its interpretation, Dirac foundation of quantum mechanics (bra and ket notation), principle of superposition **15 Lectures**

Postulational foundation of quantum mechanics: Basic postulates, explicit expression for operators corresponding to physical quantities **5 Lectures**

General uncertainty relation: Derivation and discussions, Problems **5 Lectures**

Approximation methods: Time-independent perturbation theory and its applications (anharmonic oscillator, linear stark effect, Zeeman effect), time-dependent perturbation theory, Fermi golden rule, Spontaneous and stimulated emission of radiation, harmonic perturbation, Einstein's A and B coefficients. **10 Lectures**

Angular momentum in quantum mechanics: Angular momentum operators and commutation relations between them, eigen values and eigen functions of L_z and L^2 , Angular momentum and rotation, spin of electron and Pauli spin matrices (brief idea). **10 Lectures**

Identical particles: Symmetric and-symmetric wave functions, Pauli Exclusion principle, Heitler-London theory of Hydrogen molecule **10 Lectures**

Quantum cryptography: Quantum tools and a first protocol, power of entanglement, quantifying information, from imperfect information to (near) perfect security, applications **5 Lectures**

Books Suggested:

- Srivastava R.K., Quantum Mechanics, PHI
 - N R Roy, Introduction to Quantum mechanics , Vikas Publishing House
 - Park, David, “Introduction to Quantum Mechanics”, McGraw-Hill
 - Ghatak. A, “Introduction to Quantum Mechanics”, McMillan Pub.
 - A Text book of Quantum Mechanics, P.M.Mathews and K. Venkatesan, 2nd Ed., 2010, McGraw Hill
 - Robert Eisberg and Robert Resnick , “Quantum Mechanics” , 2nd Edn., 2002, Wiley.
 - Leonard I. Schiff , “Quantum Mechanics”, 3rd Ed. 2010, Tata McGraw Hill.
 - G. Aruldas , “Quantum Mechanics”, 2nd Edn. 2002, PHI Learning of India.
 - Bruce Cameron Reed, “Quantum Mechanics”, 2008, Jones and Bartlett Learning.
 - Arno Bohm , “Quantum Mechanics: Foundations & Applications”, 3rd Edn., 1993, Springer
 - D.A.B. Miller, “Quantum Mechanics for Scientists & Engineers”, 2008, Cambridge University Press
 - Satya Prakash, “Quantum mechanics”, Pragati Prakashan, Meerut, India
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III. CORE COURSE [CCELC103]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100**Pass Marks (MSE:17 + ESE:28)=45****Instruction to Question Setter:**Mid Semester Examination (MSE):

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "**Better of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).

SEMICONDUCTOR DEVICES**Theory: 60 Hours; Tutorial: 15 Hours**

Homogeneous Semiconductors: General properties band structure carrier densities-extrinsic and intrinsic cases, impurity levels, carrier densities of impure Semiconductors, impurity band conduction.

10 Lectures

Inhomogeneous Semiconductors: (a) Equilibrium case: Semi classical treatment, Depletion layer, field and carrier densities. (b) Non-equilibrium case (biasing): Charge and carrier densities, generation and recombination currents, Diode equation, drift and diffusion currents.

10 Lectures

Diode: Breakdown phenomena, Zener diode, Schottky barrier diode, tunnel diode, backward diode, light emitting diode, photo diode with their applications, Varactor diode, p-i-n diode, IMPATT diode, TRAPATT diode, BARITT diode, SCR, power diode

15 Lectures

Bipolar Junction Transistor (BJT): Fundamentals of structure and operation, Analysis of ideal and real transistors, I-V characteristics in normal active region, charge control equation, Basics of diffusion transistors, Drift transistors, High frequency and microwave transistors, Power transistors.

15 Lectures

Field Effect transistors (FET): Fundamentals of structure and operation, I-V characteristics, JFET and MOSFET structures, power MOSFETS

15 Lectures

MOS Transistors: Fundamentals of structure and operational principle, C-V characteristics, ideal and real transistors, effect of temperature and limitations.

10 Lectures

Books Suggested:

- Khan A.A & Dey K.K, First course in Electronics, PHI
 - Arun Kumar, Introduction to Solid State Physics, PHI
 - Arun Kumar, Basic Electronics, Bharti Bhawan, Patna.
 - Ascroft, N.W and Mermin, N.D., "Solid State Physics" Harcourt Brace College Pub. USA.
 - Tyagi. M.S, "Introduction to Semiconductor Material and Devices" John Wiley & Sons.
 - Sze S.M., "Semiconductor Devices, Physics and Technology" John Wiley & Sons.
 - Michal & Shur, "Physics of Semiconductor Devices" Prentice-Hall International Inc.
 - Boylestad & Nashalsky, "Electronics Devices and Circuit Theory", Prentice Hall of India.
 - Millman & Grabel, "Microelectronics" McGraw-Hill, ISE, 1987
 - Floyd, "Electronic Devices"
 - Gayakwad, "Op-amps and Linear Integrated Circuits" Prentice Hall of India.
 - Soclof, "Design and Applications of Analog Integrated Circuits", Prentice Hall of India
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IV. CORE COURSE PRACTICAL [CPELC104]:

(Credits: Practical-05)

Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100**Pass Marks =45*****Instruction to Question Setter:******End Semester Practical Examination (ESE Pr):***

The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

Note:

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

PRACTICAL-I**Practical: 60Hours****SEMICONDUCTOR DEVICES LAB**

1. Performance study of 'Full Wave Rectifier' circuit with and without using shunt capacitor filters.
 2. Performance study of voltage regulator circuit
 - (a) Simple zener regulator circuit.
 - (b) Transistor shunt regulator circuit.
 3. BJT based voltage amplifier (CE): Design and performance study with and without negative feedback.
 4. J-FET based voltage amplifier (CS): Design and performance study.
 5. Studies of op- amp 741.
 - (a) Determination of op-amp parameters.
 - (b) Inverting amplifier, Non-inverting amplifier, Voltage follower, Differentiator, Integrator, Multivibrator.
 6. Design and performance study of Wien – Bridge oscillator / RC phase-shift oscillator.
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SEMESTER II

4 Papers**Total 100 x 4 = 400 Marks****I. CORE COURSE [CCELC201]:**

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100**Pass Marks (MSE:17 + ESE:28)=45****Instruction to Question Setter:****Mid Semester Examination (MSE):**

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "**Better of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).

INSTRUMENTATION AND MEASUREMENTS**Theory: 60 Hours; Tutorial:15 Hours**

Introduction of DC and AC Bridges: Wheatstone Bridge, Kelvin Double Bridge, Maxwell's Bridge, and Hay's Bridge, Schering's Bridge Wien's Bridge, Sources of errors in Bridges and their elimination by shielding and grounding. **10 lectures**

Principle of Analogue transducer: Resistive (Strain Gauge, POT, Thermistor and RTD), Capacitive, Piezoelectric, Thermocouple and Inductive (LVDT) and RVDT) transducer, Working principle of Digital Transducer and Optical transducer. Application of above transducers to be discussed on the basis of Pressure, Displacement, Level, Flow and Temperature measurements **10 lectures**

Errors: Errors in measurements and their statistical analysis. **5 lectures**

Digital signal conditioning: Level restoration, Bounce elimination, Threshold setting, Edge restoration, Pulse stretching and pulse generation, Schmitt trigger with hysteresis. **5 lectures**

Digital measurement technique: Time, frequency, voltage and ratio metric measurements, Digitally programmable circuits. Sampling theory and its instrumentation applications. **5 lectures**

Test instruments: Digital voltmeter and multimeter, Digital frequency counter, Vector impedance meter and Q-meter, Harmonic and distortion analyzers, Waves and spectrum analyzers, Logic-state analyzer their features, Sweep Oscillator. **8 lectures**

Oscilloscopes: CRT construction, Electrostatic focusing and deflection mechanism, Deflection sensitivity, CRT screens, Basic CRO circuits, Multiple trace displays, Alternate / Chop modes, Time bases and sweep modes, Storage and sampling Oscilloscopes. **5 lectures**

Data acquisition systems: Review of DC amplifiers, Op-amp based instrumentation amplifiers, Isolation amplifiers, Filters, S/H circuits and their interfacing to a microprocessor based systems, Analog and digital multiplexers, D/A and A/D converters need for D/A and A/D conversion, D/A converter circuits, multiplying DAC, DAC applications in dot matrix graphic display, control, automated testing and function generator, A/D conversion methods and circuits, ADC's applications, ADC's and DAC's selection criteria and methods of interfacing. **15 lectures**

Data display and recording systems: Display, Seven-segment display with LCD and LED, Static and dynamic displays, CRT dot matrix display, Character generator, Actuators for relays and motors, AC, DC and servo motors. **12 lectures**

Books Suggested:

- Oppenheim, A.V. and Schaffer, R.W., "Discrete Time Signal Processing", Prentice Hall.
 - Ahmed, N and Natrajan, T.R., "Discrete Time Signal and Systems" Reston Pub. CO.,
 - Rabinder and Gold, "Theory and Applications of Digital Signal Processing" Prentice Hall of India.
 - Bowens, A. J. "Digital Instrumentation" McGraw-Hill.
 - Barney, G. C., "Intelligent Instrumentation" PHI 1988.
 - Rathore, T, S. "Digital measurement Techniques", Narosa, New Delhi 1996.
 - Murty D.V.S., "Transducers and Instrumentation" Prentice-Hall of India.
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II. CORE COURSE [CCELC202]: (Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (MSE:17 + ESE:28)=45
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Instruction to Question Setter:Mid Semester Examination (MSE):

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "**Better of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd., 5 marks).

DIGITAL ELECTRONICS, MICROPROCESSOR AND MICROCONTROLLER

Theory: 60 Hours; Tutorial: 15 Hours

Digital Circuits and code conversion: Overview of binary system and Boolean algebra, OR, AND, NAND, NOR, XOR, XNOR and NOT gates, Logic families, TTL, NAND circuit and its analysis, ECL, NOR circuit and its analysis. BCD to binary, Binary to BCD, BCD arithmetic. Circuit Optimization Techniques, K-map, SOP, POS, AOI and OAI. **15 Lectures**

Combinational and sequential circuits: Binary adders, Comparators, Identity checkers, Data selector, Multiplexers and Encoder, Decoder and De-multiplexer, ROM and addresses, PROMs and EPROMs, Bistable latch- SR, JK, T and D flip flop, Shift registers, timers and counters. **15 Lectures**

Architecture of microprocessor: Architecture of 8085 microprocessor, 8085 instruction sets, Instruction classification, Instruction format, Addressing modes of 8085, Timing diagram, Fetch cycle, Execute cycle and machine cycle. 8085 interrupts, Software and hardware interrupts, Enabling, Disabling and masking of interrupts driven data transfer. **15 Lectures**

8085 based microcomputer system: Memory organization, I/O operations, Programmed I/O, interrupts driven I/O, DMA. **10 Lectures**

Assembly language programming of 8085: Programming techniques, Looping, Counting, Data transfer, Logic operations, Sorting, Delay programs, Use of stack and subroutines. **05 Lectures**

Microcontroller & its programming

8051 microcontroller architecture, assemble language programming, jump, loop and call instructions, input/ output ports programming, 8051 addressing modes, arithmetic and logic instructions, instructions and programs, 8051 timer programming, serial port programming, interrupt, LCD and keyboard interfacing. **15 Lectures**

Books Suggested:

- Khan A.A & Dey K.K, First course in Electronics, PHI
 - Arun Kumar, Basic Electronics, Bharti Bhawan, Patna.
 - Nutan Lata, Digital Systems and Applications, Pragati Prakashan, Merrut.
 - Mathur, A.P.,” Introduction to Microprocessors”, TMH, 1984.
 - Milvino, A.P, “Digital Computer Electronics”, 2/e, TMHedn.
 - Goankar, R.S.,” Microprocessor Architecture, Programming and Applications with the 8085 / 8080A”, Wiley Eastern Ltd.
 - The 8051 Microcontroller and Embedded Systems by Muhammad Ali *Mazidi*
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III. CORE COURSE [CCELC203]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100**Pass Marks (MSE:17 + ESE:28)=45*****Instruction to Question Setter:******Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "**Better of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd., 5 marks).

ELECTROMAGNETIC THEORY AND OPTICAL COMMUNICATION**Theory: 60 Hours; Tutorial: 15 Hours**

Waveguides: Field expression and characteristics of propagating TE and TM waves in hollow rectangular and circular wave guides, impossibility of TEM waves in hollow wave guides, Losses in wave guides, Effect of imperfect conducting walls and Q-factor (analysis for rectangular guides only)

10 Lectures

Microwave Components: Phase Shifters, Attenuators, T-junction, Magic-Tee, Directional Couplers, Standing wave detectors, and cavity resonators (rectangular and circular).

10 Lectures

Transmission line: Voltage and current relations on radio frequency transmission lines, Propagation constant, Attenuation constant and phase shift constants, Condition for low loss and low distortion, Lines terminated with zero load, infinite load, resistive load and complex impedance of dissipation less transmission lines, Uses of quarter wave and half wave transmission lines.

15 Lectures

Antenna structure: Antenna action, Short electric doublet, Radiation pattern, Gain, Receiving cross section, Beam width, minor lobes, Radiation resistance and polarization.

10 Lectures

Antenna arrays: Arrays of two isotropic point sources, Principle of pattern multiplication, Linear arrays of n isotropic point sources of equal amplitude and spacing, Broad side array, Ordinary end fire array, End fire array with increased directivity, Beam width of main lobe, Yagi antenna, Dipole antenna, Horn antenna.

10 Lectures

Fibre optics: Basic optical laws, Elements of an optical fibre transmission link. Fibres types and structure, Fibre materials and Fabrication methods, Mode and ray optics representation for step index and graded index fibres, Power flow in step index and graded index fibres, Signal attenuation and distortion in optical fibres.

10 Lectures

Fibre optical sources: Structure and materials of LED and LD sources, Operating characteristics and modulation capabilities of the LED and LD sources. Source to Fibre power launching and coupling, Lensing schemes for coupling improvement, Fibre to fibre couplings and alignment methods, Splicing techniques, Fibre connector, Principle of PIN photo detector and Avalanche photodiode, Noise in photo detectors, Detector response time, Photodiode materials, Optical receiver configuration and performance, Pre-amplifier design for optical receiver, Analog and Digital receiver.

10 Lectures

Books Suggested:

- Liao, S.Y., "Microwave Devices and Circuits" Prentice Hall, 1988.
 - Reich, Ordnung, Skalnik & Krauss., "Microwave Theory & Technique" Prentice Hall. Inc.
 - Jordan, E.C. & Balmain, K.G. "Electromagnetic waves and Radiating Systems", PHI.
 - Miah, M.A.W. "Fundamentals of Electromagnetic" TMH.
 - Kulkarni, M. "Microwave & Radar Engineering" Umesh Pub.
 - Chatterjee, R. "Fundamentals of Microwave Engg" TMH.
 - Kraus, J.D., "Antennas", Mc Graw- Hill, 1985
 - Jhonson, "Transmission Line and Network,"
 - Ryder, J.D., "Network Line and Fields",
 - Kumar, A., "Transmission Lines", New age International
 - Keiser, G., "Optical fiber communication", Mc Graw- Hill Inc.
 - Gowar, J., "Optical communication systems", PHI
 - Kao, C.K., "Optical fiber systems Technology, Design and Applications", Mc Graw- Hill Inc.
 - Senior, J., "Fiber Optical communication and systems".
 - Kare, R.P., "Fiber Optics & Optoelectronics", Oxford University Press.
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IV. CORE COURSE PRACTICAL [CPELC204]:

(Credits: Practical-05)

Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100**Pass Marks =45*****Instruction to Question Setter:******End Semester Practical Examination (ESE Pr):***

The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

Note:

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).

PRACTICAL-II**Practical: 60Hours****DIGITAL ELECTRONICS, MICROPROCESSOR & MICROCONTROLLER LAB**

At least 6 experiments are to be performed related to Digital Electronics and Microprocessor.

1. Logic Gate verification of truth table.
 2. Study of NAND Latch & NOR Latch.
 3. Multivibrator Using 555.
 4. Digital to Analog converter R-2R ladder network.
 5. Clocked RS Flip flop Using IC-7400.
 6. Un-clocked RS Flip flop Using IC-7400.
 7. Multiplexer 2 line to 1 line Using IC-7400.
 8. Multiplexer 3 line to 1 line Using IC-7400.
 9. 4 bit Binary Full adder using IC-7483.
 10. JK Flip flop and JK Master Flip flop.
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SEMESTER III

4Papers**Total 100 x 4 = 400 Marks****I. ABILITY ENHANCEMENT COURSE [ECEL301]: (Credits: Theory-05)**

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (MSE:17 + ESE:28)=45
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Instruction to Question Setter:***Mid Semester Examination (MSE):***

Paper ECEL301 will have no theory mid-sem examination, but there will be a Practical session assessment of 30 marks. In this paper break-up of 20 (mid-semester examination) + 5(Assignment) + 5(overall performance) will not be applicable.

End Semester Examination (ESE):

There will be two groups of questions. Group A is compulsory and will contain two questions. Question No.1 will be very short answer type consisting of five questions of 1 mark each. Question No.2 will be short answer type of 5 marks. Group B will contain descriptive type six questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

INDUSTRIAL ELECTRONICS**Theory: 60 Hours; Tutorial:15 Hours**

Operational amplifier: Features of difference amplifier, difference amplifier circuit using BJT and JFET and their performance analysis and improvement (use of constant current source and current mirror active load), Design and analysis of a simple operational amplifier architecture consisting of difference amplifier, voltage level shifter and emitter follower, Voltage mode operational amplifier and its building blocks, Op-amp parameters, Op-amp ideal model, Op-amp based basic functional circuits: inverting non-inverting, buffer, difference, adder/ subtractor, voltage-to-current converter, voltage-to-current converter with grounded load, current-to-voltage converter, inverting and non-inverting amplifier with single supply, integrator, differentiator. Generalized impedance convertor (GIC), Instrumentation amplifiers, All pass lead/lag circuits, Simulation of inductance, Negative impedance converter, Butterworth low pass, high pass and band pass active second order filters, Realization of higher order active filters, Comparators and their applications in wave shaping and waveform generation, D/A and A/D converters, Simulation of linear / non-linear differential equations, S/H circuit, Logarithmic circuits, Precision rectification (half and full wave). Op-amp limitations and its 1- pole model, Analysis of inverting and non-inverting amplifier with 1-pole Op-amp model, Evaluation of performance parameters. **25 Lectures**

Feedback amplifier: Concept of feedback, Feedback classification, Feedback equations, Salient feature of negative feedback system, Feedback topologies and their salient feature, Negative feedback amplifier circuits in different topologies and their analyses by feedback approach, Concept of circuit stability in negative feedback systems, Nyquist criterion of stability and Nyquist plots. **15 Lectures**

Current Feedback (CFB) operational amplifier: Salient features of CFB Op-amp and its ideal and 1-pole models, Analysis of inverting and non-inverting amplifier using CFB Op-amp. **10 Lectures**

Operational Transconductance Amplifier (OTA): Salient features of OTA and its ideal and 1-pole models, Analysis of inverting and non-inverting amplifier using OTA, Programmability in OTA based circuits. **10 Lectures**

Current Conveyor (CC): Salient features of CC and its classification, ideal and non-ideal models, CC based circuits: current amplifier, current adder/subtractor, current integrator, voltage amplifier, feedback in CC based amplifier, instrumentation amplifier, grounded inductor realization, precision rectifications. Advantages of Current Conveyor based circuits over conventional voltage OPAMP based circuits. **10 Lectures**

Current mirror: Simple current mirror and its use in realizing constant current source, Wilson current mirror, Current sink **05 Lectures**

NB : USE OF SCIENTIFIC CALCULATOR ALLOWED.

Books Suggested:

- Khan A.A & Dey K.K, First course in Electronics, PHI
 - Arun Kumar, Introduction to Solid State Physics, PHI
 - Arun Kumar, Basic Electronics, Bharti Bhawan, Patna.
 - Nutan Lata, Analog Systems and Applications, Pragati Prakashan, Merrut.
 - Ascroft, N.W and Mermin, N.D., "Solid State Physics" Harcoust Brace College Pub. USA.
 - Tyagi. M.S, "Introduction to Semiconductor Material and Devices" John Wiley & Sons.
 - Sze S.M., "Semiconductor Devices, Physics and Technology" John Wiley & Sons.
 - Michal & Shur, "Physics of Semiconductor Devices" Prentice-Hall International Inc.
 - Boylestad & Nashalsky, "Electronics Devices and Circuit Theory", Prentice Hall of India.
 - Millman & Grabel, "Microelectronics" McGraw-Hill, ISE, 1987
 - Floyd, "Electronic Devices"
 - Gayakwad, "Op-amps and Linear Integrated Circuits" Prentice Hall of India.
 - Soclof, "Design and Applications of Analog Integrated Circuits", Prentice Hall of India
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IV. CORE COURSE [CCELC302]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100**Pass Marks (MSE:17 + ESE:28)=45*****Instruction to Question Setter:******Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "**Better of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd., 5 marks).

COMMUNICATION CIRCUITS AND CONTROL SYSTEM**Theory: 60 Hours; Tutorial: 15 Hours****Communication Circuits:**

Modulation systems: Amplitude modulation and demodulation, Features of frequency modulation, Frequency modulator and FM transmission, Salient features of Phased-Locked Loop (PLL), Lock-in and capture range, PLL as an FM detector. **10 Lectures**

Pulse code modulation: Delta and adaptive delta modulation, Non-uniform quantizers, PSK FSK systems. **05 Lectures**

Noise in modulation systems: AM receiver, SSBSC, DSBSC, Square law and envelope demodulators, FM demodulators-noise in systems. Noise in PCM and DM systems, Calculation of quantization noise, Output SNR **10 Lectures**

Data transmission: Basic concepts, Analog and digital data transmission, different guided transmission media, Common transmission line impairments, Channel capacity. **07 lectures**

Data encoding: *Digital data to digital signals* – different encoding schemes like Bi-phase, Differential Manchester, Bipolar, Delay Modulation etc., Self-clocking codes, *Digital data to analog signals*- ASK, FSK, PSK etc., *Analog data to digital signals*- PCM, DM, Companding etc., *Analog data to analog signals*. **10 lectures**

Control Systems:

Introduction: Introduction to control systems, Control system terminology, Control strategies. **05 Lectures**

Modeling of dynamical system: Differential equations, Laplace transform, Transfer functions, Block diagram, State-space representation of dynamical system: electrical, mechanical and fluid system, electromechanical system, thermal robotic arm systems, Transport delays. **12 Lectures**

Frequency response analysis: Bode diagrams, polar plots, gain and phase margins, Nyquist stability criterion, closed frequency response, transfer function determination. **08 Lectures**

Basic control action and industrial automation: Basic control actions, pneumatic controllers, hydraulic controllers, integral and derivative control and system performance. **08 Lectures**

Books Suggested:

- Taub, H and Schilling, D. T. “Principles of Communication Systems”, McGraw-Hill, 1986.
 - Iyer, T.S.K., “Circuit Theory”, TMH 1983
 - Golten, J. and Verwer, A., “Control System Design and Simulation”, Mc Graw- Hill Book Company, 1991.
 - Dorf, R.C. and Bishop, R.H, “Modern Control System”, 7/e, Addison- Wesley Publishing Company, 1995,
 - Nagarath, J.M. and Gopal, M., “Control System Engineering”, Wiley
 - Ogata, “K.,Modern Control Engineering”, 2/e, PHI.
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V. CORE COURSE [CCELC303]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 30Th. 3Hr) + 70 (ESE: 3Hrs)=100**Pass Marks (MSE:17 + ESE:28)=45*****Instruction to Question Setter:******Mid Semester Examination (MSE):******Mid-semester examination consisting of 30 marks will be set as lab exercises to assess the skill developed in this paper.******End Semester Examination (ESE):******There will be two groups of questions. Group A is compulsory and will contain two questions. Question No.1 will be very short answer type consisting of five questions of 1 mark each. Question No.2 will be short answer type of 5 marks. Group B will contain descriptive type six questions of fifteen marks each, out of which any four are to be answered.******Note:*** There may be subdivisions in each question asked in Theory Examinations***The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "Better of Two" shall be applicable for computation of marks for SIA.******(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).*****DIGITAL SIGNAL PROCESSING & ITS APPLICATION****Theory: 60 Hours; Tutorial: 15 Hours****Introduction:** Discrete time systems, Discrete time signals, Difference equation description, Characterization of digital filters and time domain analysis, Z-transforms and their applications in solving difference equations, Frequency domain analysis, BIBO stability. **10 Lectures****Discrete Hilbert transforms and DFT:** Minimum phase functions Discrete Hilbert Transforms, DFT and inverse DFT properties inter relationship with Z-transforms and Hilbert transforms, periodic Convolution, Direct evaluation of DFT, FFT algorithms, Decimation in time and Decimation in frequency. **10 Lectures****Digital filter structures:** Direct form I and II Cascade, Parallel and ladder realizations. **07 Lectures****Filter Function Approximations and Transformations:** Review of approximation of ideal analog filter response, Butterworth, Chebyshev type I & II, Elliptic filters, Time delay and maximally flat delay approximations, Digital filter transformations. **07 Lectures****MATLAB Basics and Programming:** Introduction of MATLAB package, Matrices in MATLAB, MATLAB programming: M-files, script and function files, MATLAB commands, System analysis using transfer function, Analysis of state variable models, Control system characteristics, performance and stability analyses. Simulink related design and testing. **26 Lectures****MATLAB AND ELECTRONIC SIMULATION LAB EXERCISES****15 SESSIONS**

- Simulation of Electronic circuit and systems using LT Spice, PSpice in time and frequency domains.
- Time domain and frequency domain analysis of systems in Matlab environment using mathematical models.
- Familiarity and use of scientific packages as Scientific WorkPlace (Scientific Word Processor), MATLAB/SIMULINK solve problems in Electronics & Communication.

Books Suggested:

- Oppenheim, A.V. and Schaffer, R.W., “Discrete Time Signal Processing”, Prentice Hall.
 - Ahmed, N and Natrajan, T.R., “Discrete Time Signal and Systems” Reston Pub. CO.,
 - Rabinder and Gold, “Theory and Applications of Digital Signal Processing” Prentice Hall of India.
 - Bowens, A. J. “Digital Instrumentation” McGraw-Hill.
 - Barney, G. C., Intelligent Instrumentation” PHI 1988.
 - Rathore, T, S. “Digital measurement Techniques”, Narosa, New Delhi 1996.
 - Murty D.V.S., “Transducers and Instrumentation” Prentice-Hall of India.
 - Rashid, M., "Spice for Circuits and Electronics Using PSpice", Prentice- Hall, Inc.1990.
 - MATLAB and SIMULINK: Introduction to Applications. P. S. Mallick, SciTech, 3Ed. 2009
 - Rudra Pratap, “Getting started with MatLab”, Oxford University Press, 2015.
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IV. CORE COURSE PRACTICAL [CPELC304]:

(Credits: Practical-05)

Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100**Pass Marks =45*****Instruction to Question Setter:******End Semester Practical Examination (ESE Pr):***

The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

Note:

(Attendance Upto60%, 1mark; 60<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

PRACTICAL-III**Practical: 60Hours****COMMUNICATION & CONTROL SYSTEM LAB**

At least 6 experiments are to be performed relating to control systems and communication.

1. Demonstrate the Amplitude Modulation.
 2. Demonstrate the Frequency Modulation.
 3. Demonstrate the Phase Modulation.
 4. Demonstrate the Pulse Code Modulation
 5. Demonstrate the Applications of SCADA (Supervisory Computer Control System)
 6. Demonstrate the Applications of Pneumatic Cylinder
 7. Demonstrate the temperature Measuring Instruments.
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SEMESTER IV

4 Papers**Total 100 x 4 = 400 Marks**
I. GENERIC/DISCIPLINE CENTRIC ELECTIVE [ECEL401]:
 (Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (MSE:17 + ESE:28)=45
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Instruction to Question Setter:***Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "**Better of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).

COMPUTER NETWORKING & DATA COMMUNICATION**Theory: 60 Hours; Tutorial: 15 Hours**

Networks: Network types and architecture (broadcast, multicast, LAN, MAN, WAN, topology, token ring, FDDI, Cabling). Protocols, interfaces and services, X-25, ISDN, ATM, VPN, frame relay, wireless transmission, bridges. TCP/IP and ISOOSI Models. Routing, congestion and flow control, tunneling, internetwork routing. Datalink protocols, Multiple access protocols. **10 lectures**

Protocols and Internet: PTCP, UDP, Transport layer error recovery, Application layer services and protocols. IP addressing, Network security, Evolution of internet, Internet architecture; goals and key issues related to Internetworking technologies, Internet connectivity (dial-up, dedicated lines, broadband, DSL, radio, VSAT, etc.), Domain Name Scheme, Technology and tools relevant for web access (FTP, email, search tools, etc.), Internet security. Multimedia, Techniques of data compression, voice, video, Mbone and interactive video-on-demand over the Internet Mobile Computing. Fundamentals of Network Management (NM), Need for NM, Elements of NM system (Manager, Agent and a protocol, SNMP), Functional areas of NM defined by ISO Fault Management, Configuration Management, Performance Management, Security Management, Accounting Management, NM standards, TMN, Web based NM (Introduction), Case studies: HP Open-View, IBM Net-view, SUN Solaris Enterprise Manager. **18 lectures**

Digital data communication techniques: Synchronous and asynchronous transmission, error detection techniques like parity check, LRC and CRC, Cyclic Redundancy check implementation using shift register method, Interfacing standards like RS 232-C, RS 489/ RS- 422-A/ RS 423 and X-21. Data link control: Link configurations, Flow control using stop and wait and sliding window protocol, Error control using stop and wait ARG, Go-back to N ARQ and Selective Reject ARQ, Data link control

protocols like HDLC, Comparison of HDLC with BSC, Data transparency using bit stuffing.

20 lectures

Multiplexing: Frequency division multiplexing, synchronous time division multiplexing, Asynchronous time division multiplexing, Carrier standards, Subrate multiplexing. **7 lectures**

Switched networks & Circuit switching: Comparison of circuit switching, Message switching, Datagram packet switching and virtual circuit packet switching techniques, Circuit switched network, Digital switching concepts like space division switching, 3-stage space division switch, TDM bus switching, Time Slot Interchange TSI and Time Multiplex switch TMS, Ping- Pong Protocol, Digital Private Branch Exchange general architecture, telephone call processing requirements. General principles of datagram packet switching and virtual packet switching, Use of least cost algorithms in routing, General description, Routing techniques, Traffic control, Congestion control, Deadlock avoidance techniques, error control etc, for the example systems like Original ARPANET, Revised ARPANET, TYMNET I, TYMNET II, SNA and DNA, x. 25 standard. **20 lectures**

Books Suggested:

- Tyagi. M.S, "Introduction to Semiconductor Material and Devices" John Wiley & Sons.
 - Maly, W. "Atlas of IC Technology: An Introduction to VLSI Processes" The Benjamin/Cummings Publishing Company, Inc 1987.
 - Bohdan, O. S., "Multimedia Networking", McGraw-Hill, Singapore, 1995 (ISE)
 - Marilee, F, et al., "Internetworking Technologies Handbook", Cisco Press, 1997.
 - Buchanan, N., "Advanced Data Communication and Networking", Chapman & Hall, London, 1997.
 - Stalling, W., "Computer Networks", PHI.
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II. GENERIC/DISCIPLINE CENTRIC ELECTIVE [ECELC402]: (Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (MSE:17 + ESE:28)=45
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Instruction to Question Setter:

Mid Semester Examination (MSE):

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

Note: There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Attendance/ regular interactions of 05 marks and (c) Seminar/ assignment of 05 marks. "**Better of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks).

VLSI DESIGN AND EMBEDDED SYSTEM

Theory: 60 Hours; Tutorial: 15 Hours

Processing steps: Photolithography, Oxidation, Layer deposition, Etching diffusion, Implantation, IC design layout, Photolithographic masks, Process instabilities. **06 Lectures**

Bipolar technology: Fabrication steps in bipolar process, Fabrication of NPN transistors, diodes, resistors, capacitors, Substrate and lateral PNP transistors, Segments of IC layout, Introduction to advanced bipolar technology. **06 Lectures**

NMOS technology: Review of NMOS polysilicon gate technology, IC elements in NMOS technology, Enhancement depletion and parasitic transistors, NMOS cells – cross coupled NOR gates, NOR gate, NAND gate, AND –OR –INVERT gate, parasitic capacitance in NMOS gates, Introduction to advanced CMOS technology. **06 Lectures**

CMOS technology: N-well CMOS technology, Layout of the NAND gate, Introduction to advanced CMOS technology. **06 Lectures**

Mixed Bipolar–MOS technology: Bipolar transistors in CMOS circuit, Simple BiMOS process, BiMOS technology.

Circuit Simulation using SPICE

Introduction to simulations package LT Spice, PSpice, Circuit entry, Passive components description, Semiconductor components description, Independent and dependent sources, Op-amp micro model limitations and capabilities, Sub circuits description, PSpice commands, Time domain and frequency domain analyses of basic circuit, Use of probe to study simulation results, Simulation versus practical, PSpice error messages, PSpice as digital and mixed analog-digital simulator, Block-diagram simulators.

10 Lectures

Technology of SRAM: Trade-offs in memory design and fabrication, Memory cell layout, SRAM process, Electrical diagram of a single-bit memory cell. **06 Lectures**

Combinational Circuit Design using VHDL & Verilog

Standard Logic gates, Universal logic gates, multiplexers, Decoder, Encoder, Demultiplexer, adder, subtractor, ALU. **10 Lectures**

Sequential Circuit Design using VHDL & Verilog

Flip-flops: SR FF, D FF, T FF, JK FF, Master slave JK FF, Counter, Timer and Registers.

10 Lectures

Introduction to Embedded System:

Embedded system overview, Design challenges, Common design metrics, Time-to-market design metric, NRE and unit cost design metrics, Performance design metric, Processor technology, General purpose processors –software and hardware, Application specific processors, IC technology, Semi-custom ASIC.

Timers, Counters, Watch-dog timers, Example of reaction timer, Watchdog timer, UART, PWM , Controlling a dc motor using a PWM. General purpose processor, ASIP's and ASIC's, semiconductor IC's programmable logic devices of CGD, Processor selection for embedded systems, special purpose processor **15 Lectures**

Books Suggested:

- Tyagi. M.S, "Introduction to Semiconductor Material and Devices" John Wiley & Sons.
 - Maly, W. "Atlas of IC Technology: An Introduction to VLSI Processes" The Benjamin/Cummings Publishing Company, Inc 1987.
 - Eshragian, "VLSI Systems" PHI
 - **VLSI Design http://www.ide.iitkgp.ernet.in/Pedagogy_view/example.jsp?USER_ID=210**
 - *Embedded System Design: A Unified Hardware / Software* by Tony Givargis Frank *Vahid*,
 - Bohdan, O. S., "Multimedia Networking", McGraw-Hill, Singapore, 1995 (ISE)
 - Marilee, F, et al., "Internetworking Technologies Handbook", Cisco Press, 1997.
 - Buchanan, N., "Advanced Data Communication and Networking", Chapman & Hall, London, 1997.
 - Stalling, W., "Computer Networks", PHI.
 - Eshragian, "VLSI Systems" PHI
-

III. GE/DC PRACTICAL [EPELC403]:

(Credits: Practical-05)

Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100**Pass Marks =45*****Instruction to Question Setter:******End Semester Practical Examination (ESE Pr):***

The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

Note:

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks).

PRACTICAL –IV**ELECTIVE PAPER LAB**

At least 6 experiments are to be performed in the concerned Elective/Special Laboratory relating to the Elective/Special paper.

1. Design & simulation of CMOS logic gates using SPICE/ Mentor Graphics/ Cadence
 2. Design & Simulations of CMOS Amplifier using SPICE/ Mentor Graphics/ Cadence
 3. Design & Simulations of CMOS Operational Amplifier using SPICE/ Mentor Graphics/ Cadence
 4. Design of Combinational circuits using VHDL & Verilog & Simulations through Xilinx's or Active HDL or Model Sim
 5. Design of Sequential circuits using VHDL & Verilog & Simulations through Xilinx's or Active HDL or Model Sim
 6. Controlling a dc motor using a PWM.
-

VI. CORE COURSE (PROJECT) [PRPHY404]:

(Credits: 05)

Marks : 100 (ESE: 3Hrs)=100**Pass Marks =45*****Guidelines to Examiners for******End Semester Examination (ESE):***

Overall project dissertation may be evaluated under the following heads:

- *Motivation for the choice of topic*
- *Project dissertation design*
- *Methodology and Content depth*
- *Results and Discussion*
- *Future Scope & References*
- *Participation in Internship programme with reputed organization*
- *Application of Research technique in Data collection*
- *Report Presentation*
- *Presentation style*
- *Viva-voce*

PROJECT WORK

The project is aimed at developing a capacity of innovative design of circuits / systems for solving problems in different areas of Electronics & Communication. Some of the problems may be outside the conventional course material.

Each student **must** submit two copies of the dissertation work duly forwarded by the **Head of the Department and duly signed by the supervisor concerned**. The forwarded copies will be submitted in the Department of Physics, Ranchi University, for evaluation (Seven days before the seminar).

The paper will consist of

- (a) Field work/Lab work related to the project.
- (b) Preparation of dissertation based on the work undertaken.
- (c) Presentation of project work in the seminar on the assigned topic in the P.G.

Department of Physics, Ranchi University, Ranchi & open viva there on.

Topics

Each students shall have to complete a project work on any topic of his choice, but relevant to the frontier area of Science and Technology, or on a topic allotted by his/her Project Guide/Supervisor/Department in Semester -IV. This is compulsory and the candidates shall ensure that his project is on a relevant topic completed by him independently with the help and inputs from his/her guide/supervisor. Other guidelines pertaining to this paper shall be provided by the department.

NB:- Students will select topics for the project work in consultation with a teacher of the department. The Seminar will be held in the Department of Physics, Ranchi University, Ranchi.

**DISTRIBUTION OF CREDITS FOR P.G. PROGRAMME (SEMESTER-WISE) FOR
POSTGRADUATE ‘P.G. Voc./M.Sc./M.A./M.Com’ PROGRAMME**

Table B-1: Semester wise distribution of 80 Credits for Subjects with Practical Papers.

Semester	CC	FC	GE/DC	AE	Total credits
Semester I	15	05			20
Semester II	20				20
Semester III	15			05	20
Semester IV	5		15		20
	55	05	15	05	80

Table B-1: Semester wise distribution of 80 Credits for Subjects without Practical Papers.

Semester	CC	FC	GE/DC	AE	Total credits
Semester I	15	05			20
Semester II	20				20
Semester III	15			05	20
Semester IV	10		10		20
	60	05	10	05	80

CC=Core Course; FC=Foundation Compulsory/Elective Course; GE=Generic Elective; SE=Skill Enhancement Course; DC=Discipline Centric Elective

**SAMPLE CALCULATION FOR SGPA & CGPA FOR POSTGRADUATE 'P.G.
Voc./M.Sc./M.A./M.Com' PROGRAMME**

Table B-2: Sample calculation for SGPA for M.Sc./M.A./M.Com Programme

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SGPA (Credit Point/Credit)
Semester I					
FC	05	A	8	40	
C-1	05	B+	7	35	
C-2	05	B	6	30	
C-3/CP	05	B	6	30	
Total	20			135	6.60 (135/20)
Semester II					
C-4	05	B	6	30	
C-5	05	C	5	25	
C-6	05	B+	7	35	
C-7/CP	05	A+	9	45	
Total	20			135	6.60 (135/20)
Semester III					
EC-1	05	A+	9	45	
C-8	05	O	10	50	
C-9	05	A	8	40	
C-10/CP	05	A	8	40	
Total	20			175	8.75 (175/20)
Semester IV					
EC-2/EC-2	05	B	6	30	
EC-3/EC-3	05	A+	9	45	
C11/EP	05	B	6	30	
Project	05	A+	9	45	
Total	20			150	7.50 (150/20)
CGPA					
Grand Total	80			595	7.44 (595/80)

Table B-3: Sample calculation for CGPA for P.G. Vocational M.Sc./M.A./M.Com Programme

Semester I	Semester II	Semester III	Semester IV
Credit:20; SGPA:6.60	Credit:20; SGPA: 6.60	Credit:20; SGPA: 8.75	Credit:20; SGPA: 7.50

Thus CGPA= (20x6.60+20x6.60+20x8.75+20x7.50) /80=7.36

DISTRIBUTION OF MARKS FOR EXAMINATIONS AND FORMAT OF QUESTION PAPERS

Distribution of Marks for Mid Semester Evaluation:**Table No. 15:** Distribution of marks of Theory Examinations of Mid Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A	Group B
Mid Sem*	T30*	30 (20 +5 +5)	17	1 Hr	5 x1 =5	3 (out of 5) x5 =15	05	5

***There shall be 20 marks theory examination for mid sem, 05 marks for attendance/ regular interactions & 05 marks for seminar/ assignment/ term paper given by faculty concerned in classrooms.**

Distribution of Marks for End Semester Theory Examinations:**Table No. 16:** Marks distribution of Theory Examinations of End Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A# (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A#	Group B
End Sem	T50	50	--	3 Hrs	2 x5 =10	2 (out of 3) x20 =40	2	3
	T70	70	28	3 Hrs	Q.No.1 (5x1) + 1x5 =10	4 (out of 6) x15 =60	2	6

Question No.1 in Group-A carries very short answer type questions of 1 Mark

Note : There may be subdivisions in each question asked in Theory Examinations.

FORMAT OF QUESTION PAPER FOR MID SEM EXAMINATION

20 MARKS



Ranchi University, Ranchi

Mid Sem No.Exam Year

Subject/ Code

F.M. =20**Time**=1Hr.**General Instructions:**

समान्य निर्देश :

- i. **Group A** carries very short answer type compulsory questions.
(खंड 'A' में अत्यंत लघु उत्तरीय अनिवार्य प्रश्न हैं।)
- ii. **Answer 3 out of 5** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के पाँच में से किन्हीं तीन विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)
- iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
- iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
- v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

- | | | |
|----|-------|---------|
| 1. | ..... | [5x1=5] |
| 2. | ..... |  |
| 3. | ..... |  |
| 4. | ..... |  |
| 5. | ..... |  |

Group B

- | | | |
|-----|-------|-----|
| 6. | ..... | [5] |
| 7. | ..... | [5] |
| 8. | ..... | [5] |
| 9. | ..... | [5] |
| 10. | ..... | [5] |

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

50 MARKS



Ranchi University, Ranchi

End Sem No.Exam Year

Subject/ Code

F.M. =50

General Instructions:

- i. **Group A** carries very short answer type **compulsory** questions.
- ii. **Answer 2 out of 3** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के तीन में से किन्हीं दो विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)
- iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
- iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
- v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. [5]
2. [5]

Group B

3. [20]
4. [20]
5. [20]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

70 MARKS



Ranchi University, Ranchi

End Sem No.Exam Year

Subject/ Code

F.M. =70**P.M.** =28**Time**=3Hrs.**General Instructions:**

- i. **Group A** carries very short answer type **compulsory** questions.
- ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)
- iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
- iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
- v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

- | | | |
|----|-----------|---------|
| 1. | | [5x1=5] |
| | i. | |
| | ii. | |
| | iii. | |
| | iv. | |
| | v. | |
| 2. | ..... | [5] |

Group B

- | | | |
|----|-------|------|
| 3. | ..... | [15] |
| 4. | ..... | [15] |
| 5. | ..... | [15] |
| 6. | ..... | [15] |
| 7. | ..... | [15] |
| 8. | ..... | [15] |

Note: There may be subdivisions in each question asked in Theory Examination.