SEMESTER III & IV

B. SC. PHYSICAL SCIENCES

(ELECTRONICS)

Semester III

CEL 304
Core Course V (Electronics)
Communication Electronics - I

(Credits: 02; 30 Hrs (2Hrs /week)))
Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I   (8 Hours)

Electronic communication:

Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.

UNIT-II   (8 Hours)

Analog Modulation:

Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection.

UNIT-III   (7 Hours)

Analog Modulation:

Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super heterodyne receiver.

UNIT-IV   (7 Hours)

Analog Pulse Modulation:

Channel capacity, Sampling theorem, Basic Principles- PAM, PWM, PPM modulation and detection technique for PAM only, Multiplexing.

Reference Books:

- Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011,Oxford University Press.
- Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
- Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
- Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
- Communication Systems, S. Haykin, 2006, Wiley India
- Electronic Communication system, Blake, Cengage, 5th edition.
- Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press

CEL 305
Core Course VI (Electronics)
Microprocessor
(Credits: 02; 30 Hrs (2Hrs /week)))

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I   (8 Hours)
Microcomputer Organization:
Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.

UNIT-II   (6 Hours)
8085 Microprocessor Architecture:

Main features of 8085. Block diagram. Pin-out diagram of 8085. Data and address buses. Registers. ALU. Stack memory. Program counter. Hardware and software interrupts.

UNIT-III   (8 Hours)
8085 Programming :

Instruction classification, Instructions set (Data transfer including stacks. Arithmetic, logical, branch, and control instructions). Subroutines, delay loops. Timing & Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI.

UNIT-IV   (7 Hours)
Introduction to embedded system:
Embedded systems and general purpose computer systems. Architecture of embedded system. Classifications, applications and purpose of embedded systems.

Reference Books:
* Microprocessor Architecture Programming & applications with 8085, 2002, R.S.Goankar, Prentice Hall.
* Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press
* Advanced Microprocessors and Interfacing : Badri Ram; TMH
* Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill
* Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill
* The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.

CEP 309
Practical III (Electronics)
Communication Electronics LAB
(Credits: 02; 60 Hrs (4Hrs /week)

Marks: 100
Time: 4 Hours

At least 8 experiments are to be performed including at least 6 experiments from following:

1. To design an Amplitude Modulator using Transistor.

2. To study envelope detector for demodulation of AM signal

3. To study FM Generator and Detector circuit

4. To study AM Transmitter and Receiver

5. To study FM Transmitter and Receiver

6. To study Time Division Multiplexing (TDM)

7. To study Pulse Amplitude Modulation (PAM)

8. To study Pulse Width Modulation (PWM)

9. To study Pulse Position Modulation (PPM)

10. To study Pulse Code Modulation (PCM)

CEL 404
Core Course-VII (Electronics)
Communication Electronics - II
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I   (8 Hours)

Digital Pulse Modulation:
Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK).

UNIT-II   (8 Hours)

Introduction to Communication and Navigation systems:

Satellite Communication– Introduction, need, Geosynchronous satellite orbits, geostationary satellite, advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink. GPS navigation system (qualitative idea only)

UNIT-III   (7 Hours)

Mobile Telephony System:
Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption

UNIT-IV   (7 Hours)

Mobile Telephony System:
Architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only).

Reference Books:
- Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011,Oxford University Press.
- Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
- Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
- Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
- Communication Systems, S. Haykin, 2006, Wiley India
- Electronic Communication system, Blake, Cengage, 5th edition.
- Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press

CEL 405
Core Course-VIII (Electronics)
Microcontroller
(Credits: 02; 30 Hrs (2Hrs /week)))

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

<table>
<tr><td style="text-align:center">**UNIT-I**</td><td style="text-align:right">**(8 Hours)**</td></tr>
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8051 microcontroller:
Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

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<tr><td style="text-align:center">**UNIT-II**</td><td style="text-align:right">**(7 Hours)**</td></tr>
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8051 I/O port programming:
Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description & their functions, I/O port programming in 8051 (using assembly language), I/O programming: Bit manipulation.

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<tr><td style="text-align:center">**UNIT-III**</td><td style="text-align:right">**(8 Hours)**</td></tr>
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8051 Programming:
8051 addressing modes and accessing memory locations using various addressing modes, assembly language instructions using each addressing mode, arithmetic and logic instructions

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<tr><td style="text-align:center">**UNIT-IV**</td><td style="text-align:right">**(7 Hours)**</td></tr>
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8051 Programming:
8051 programming in C: for time delay & I/O operations and manipulation, for arithmetic and logic operations, for ASCII and BCD conversions.

Reference Books:
- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
- Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press
- 8051 microcontrollers, Satish Shah, 2010, Oxford University Press.
- Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill
- Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill
- Embedded Systems: Design & applications, S.F. Barrett, 2008, Pearson Education India
- Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning

CEP 409

Practical -IV (Electronics)

Microprocessor and Microcontroller Lab

(Credits: 02; 60 Hrs (4Hrs /week)

Marks: 100

Time: 4 Hours

At least 8 experiments are to be performed including at least 6 experiments from following:

Section-A: Programs using 8085 Microprocessor

1. Addition and subtraction of numbers using direct addressing mode

2. Addition and subtraction of numbers using indirect addressing mode

3. Multiplication by repeated addition.

4. Division by repeated subtraction.

5. Handling of 16-bit Numbers.

6. Use of CALL and RETURN Instruction.

7. Block data handling.

8. Other programs (e.g. Parity Check, using interrupts, etc.).

Section-B: Experiments using 8051 microcontroller:

1. To find that the given numbers is prime or not.

2. To find the factorial of a number.

3. Write a program to make the two numbers equal by increasing the smallest
   number and decreasing the largest number.

4. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate
   binary counter (8 bit) on LED's .

5. Program to glow the first four LEDs then next four using TIMER application.

6. Program to rotate the contents of the accumulator first right and then left.

7. Program to run a countdown from 9-0 in the seven segment LED display.

8. To interface seven segment LED display with 8051 microcontroller and display
   'HELP' in the seven segment LED display.

9. To toggle '1234' as '1324' in the seven segment LED display.

10. Interface stepper motor with 8051 and write a program to move the motor
    through a given angle in clock wise or counter clockwise direction.

11. Application of embedded systems: Temperature measurement & display on LCD

CML 406: Partial Differential Equations & Special Functions

Marks (Theory): 80   **Marks(Total) : 100**
Marks (Internal Assessment) : 20   **Time   : 3Hrs**

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.** Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I
Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

Section – II
Linear partial differential equations of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant coefficients, Partial differential equation with variable coefficients reducible to equations with constant coefficients, their complimentary functions and particular integrals, Equations reducible to linear equations with constant coefficients. Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

Section – III
Classification of linear partial differential equations of second order, hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order, Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation.

Section – IV
Series solution of differential equations – Power series method. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions. Legendre differential equation and its solution: Legendre function and its properties-Recurrence Relations and generating functions. Orthogonality of Legendre polynomial. Rodrigues' Formula for Legendre Polynomial.

Books Recommended:
1. D.A. Murray, Introductory Course on Differential Equations, Orient Longman, (India), 1967
2. Erwin Kreyszing, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd.