

DIGITAL ELECTRONICS

BEG 230

Year: II

Semester: I

Teaching Schedule Hours/Works			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	-	3	Theory	Practical	Theory	Practical	
			20	50	80	-	150

***Continuous**

****Duration: 3hours**

Course Objectives: To provide fundamental of Digital Electronics digital computer design and application of digital devices.

1. Binary Systems

(4hours)

- 1.1 Digital Systems
- 1.2 Binary Numbers
- 1.3 Number Base Conversion
- 1.4 Integrated Circuits

2. Boolean Algebra and Logic gates

(5hours)

- 2.1 Base Definition
- 2.2 Boolean algebra and functions
- 2.3 Logical Operator
- 2.4 Digital Logic Gates
- 2.5 IC Digital Logic Gates

3. Combination Logic

(5hours)

- 3.1 Design procedure
- 3.2 Adders
- 3.3 Subtractors
- 3.4 Code Conversion
- 3.5 Analysis Procedure
- 3.6 Multilevel NAND and NOR Circuits
- 3.7 Exclusive-OR and Equivalence Function

4. Combination Logic with MSI and LSI

(5hours)

- 4.1 Binary parallel adder
- 4.2 Decimal Adder
- 4.3 Magnitude Comparator
- 4.4 Decoders
- 4.5 Multiplexers
- 4.6 Read Only Memory
- 4.7 Programmable Logic Array (PLA)

5. Sequential Logic

(6hours)

- 5.1 Flip-Flops
- 5.2 Triggers
- 5.3 Analysis of clocked sequential circuits
- 5.4 Design of Procedure
- 5.5 Design of counters
- 5.6 Design with State Equations

6. Registers, Counters and The Memory Unit (6hours)

- 6.1 Registers
- 6.2 Shift Registers
- 6.3 Ripple Counters
- 6.4 Synchronous Counters
- 6.5 Timing Sequences
- 6.6 Time Memory Unit

7. Processor Logic Design (6hours)

- 7.1 Processor Organization
- 7.2 Arithmetic Logic Unit
- 7.3 Design of Arithmetic Circuit
- 7.4 Design of Logic Circuit
- 7.5 Design of Arithmetic Logic Unit
- 7.6 Design of Shifter, Status Register

8. Digital Integrated Circuits (8hours)

- 8.1 Bipolar Transistor Characteristics
- 8.2 RTL and DTL Circuits
- 8.3 Integrated- Injection Logic
- 8.4 Transistor-transistor Logic
- 8.5 Emitter- Coupled Logic
- 8.6 Metal-Oxide Semiconductor
- 8.7 Complementary MOS

Laboratory:

The 12 laboratories based on Digital Electronics

1. Familiarization with AND, OR and INVERTER Gates
2. DeMorgan's Law and Familiarization with NAND and NOR gates
3. Familiarization with binary addition and subtraction
4. Construction of true complement generator
5. BCD to seven segment decoder.
6. Encoder, decoder, multiplexer and De- multiplexer
7. Latches, RS, Master slave and T type flip flops
8. D and J-K types flip-flops
9. Shift Registers, SIPO,PISO
10. Ripple counter, Synchronous counter DODN-counter
11. Familiarization with computer package for logic circuit design
12. Design digital circuits using Electronics Work Bench.

Reference:

- William I. Fletcher, "An Engineering Approach to Digital Design", Prentice Hall of India, New Delhi, 1990.
- P. Malvino, Jerand A. Brown, "Digital Computer Electronics," 1995
- D.A. Hodges and H.G. Jackson, "Analysis and design of Digital Integrated Circuit," McGraw-Hill, New York, 1983.
- Mano, "Logic and Computer Design Fundamental," Pearson Education.

THERMODYNAMICS, HEAT AND MASS TRANSFER

BEG 240 ME

Year: II

Semester: I

Teaching Schedule Hours/ Week			Examination Scheme				Total 125
Theory	Tutorial	Practical	Internal Assessment		Final		
			Theory	Practical*	Theory**	Practical	
3	-	3/2	20	25	80	-	

*Continuous

**Duration: 3 hours

1.0 Energy and the First law (3 hrs)

- 1.1 Systems and energy conservation
- 1.2 Energy transfer as work and heat
- 1.3 Energy balance for a control mass, examples for no flow and steady flow systems

2.0 Properties and state of substances (4 hrs)

- 2.2 General nature of a compressible substance
- 2.1 Simple substance and equations of state
- 2.3 Metastable states in phase transition
- 2.4 Physical properties and engineering analysis
- 2.5 The perfect gas
- 2.6 The simple magnetic substance

3.0 Energy Analysis: (2 hrs)

- 3.1 General methodology
- 3.2 Examples of control mass energy analysis and volume energy analysis

4.0 Entropy and Second Law: (3 hrs)

- 4.1 Concept of entropy
- 4.2 Reversible and irreversible processes
- 4.3 Entropy as a function of state
- 4.4 Applications of energy conversion

5.0 Characteristics of thermodynamics systems: (3 hrs)

- 5.1 The carnot cycle
- 5.2 Process Models
- 5.3 Use of the Rankine cycle
- 5.4 Vapour refrigeration systems
- 5.5 Power systems

6.0 Introduction to Heat Transfer: (9 hrs)

- 6.1 Basic concepts and models of heat transfer
- 6.2 The conduction rate equation and heat transfer coefficient
- 6.3 Conduction: insulation, R values, electric analogies, overall coefficient for plane walls, cylinders and fins, conduction shape factor, transient heat conduction
- 6.4 Free and forced convection: laminar and turbulent boundary layers, flat plates, tubes and fins, cross flow and application to heat exchangers.
- 6.5 Radiation: Radiation properties for black and gray bodies; applications; earth- atmosphere system; radiant heating systems.
- 6.6 Heat transfer applications in electronics and electrical engineering finned heat sinks for electronics applications, forced air cooling of electronic instrumentation, cooling of electric equipment such as transformers, motors, generators, power converters.

7.0 Fluid**(2 hrs)**

- 7.1 Definition of a fluid
- 7.2 Viscosity
- 7.3 Density: Specific gravity, Specific volume
- 7.4 Bulk modulus
- 7.5 Surface tension

8.0 Fluid Statics**(4 hrs)**

- 8.1 Pressure variation in static fluids
- 8.2 Pressure Measurements: Units and scales
- 8.3 Forces on plan and curved submerged surfaces
- 8.4 Buoyant Force
- 8.5 Stability of floating and submerged bodies

9.0 Fluid Flow**(4 hrs)**

- 9.1 Types of flow and definitions, The continuity equation
- 9.2 Streamlines and the potential function
- 9.3 The Bernoulli energy equation
- 9.4 The momentum equation
- 9.5 Applications

10.0 Viscous Flow**(4 hrs)**

- 10.1 Turbulent and laminar flow, Reynold's number
- 10.2 Velocity distribution
- 10.3 Boundary layer
- 10.4 Drag on immersed bodies
- 10.5 Resistance to flow in open and closed conduits
- 10.6 Pressure losses in pipe flow

11.0 Turbo machinery**(5 hrs)**

- 11.1 Geometrically similar (homologous) machines
- 11.2 Performance equations for pumps and turbines
- 11.3 Configurations and characteristics of turbo machines: axial and centrifugal pumps and blowers, impulse turbines (Pelton), reaction turbines (Francis, Kaplan)
- 11.4 Cavitation

Laboratory:

1. Temperature and pressure measurement.
2. Compression and expansion of gases and heat equivalent of work.
3. Heat conduction and convection
4. Refrigerator and/or heat pump.
5. Hydrostatics and properties of fluids: viscous flow in pipes.
6. Air flow studies in axial and centrifugal fans.
7. Turbomachines: Kaplan, Pelton and Francis.

References:

1. W.C.Reynolds, "Engineering Thermodynamics", Mc Graw Hill, 2nd Edition, 1970
2. M.N. Ozisik, "Heat Transfer - A Basic Approach", Mc Graw Hill, 1985
3. De Witt, "Fundamentals of Heat and Mass Transfer", Wiley 1985
4. Saberski, Acosta and Hauptmann, "Fluid Mechanics".

MATHEMATICS III

BEG 201 SH

Year: II

Semester :1

Teaching Schedule Hour/ Week			Examination Scheme						Total Marks	Remarks
			Final				Internal Assessment			
			Theory		Practical		Theory Marks	Practical Marks		
L	P	T	Duration	Marks	Duration	Marks				
3		2	3	80			20		100	

Course objectives: The purpose of this Course is to round out the student's preparation more sophisticated applications with an introduction of linear algebra, a continuous of the study of ordinary differential equations and an introduction to vector calculus.

1. Matrices and determinants

15

- 1.1 Matrix and determinants
- 1.2 Vector spaces
- 1.3 Linear transformation
- 1.4 System of linear equation, gauss elimination
- 1.5 Rank matrix inverse
- 1.6 Eigen value eigen vectors applications

2. Laplace Transformation

9

- 2.1 Laplace tranforms
- 2.2 Standerd transforms
- 2.3 Inverse Laplace transforms
- 2.4 Application to differential equations

3. Line Integration

6

- 3.1 Definition of line integration
- 3.2 Evaluation of line integration
- 3.3 Double integration
- 3.4 Transformation of double integrals into integrals rails beta gamonafun dirtchel integral

4. Surface Integrals & volume Integrals

7

- 4.1 Surfaces
- 4.2 tangent planes, first fundamental form and area
- 4.3 Surface integrals
- 4.4 Volume integrals, Diritchlet integrals

5. Integral Theorem

8

- 5.1 Greens theorem in the plane
- 5.2 Triple integrals and divergens theorem of gauss
- 5.3 Consequences and applications of the divergens theorem
- 5.4 Stock's the theorem
- 5.5 Consequence and applications of stock's theorem
- 5.6 Time integrals and independence of path

Text Book

1. E.Kreszig "Advanced Engineering Mathematics" Fifth edition, willey, New York
2. M.N Guterman and ZN Niteeki "Differential equations, a first course" 2nd Edition Sanuders, New York.

MECHANICS AND PROPERTIES OF SOLIDS

BEG 250 CI

Year: II

Semester: I

Teaching Schedule Hours/Works			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	3/2	Theory	Practical	Theory	Practical	
			20	25	80	-	125

Course objectives: the objective of this course is to provide the basis for principle of analysis of stress, strain and deformation of solids and structures.

1.0 Introduction 3

- 1.1 Types of loads, supports and their symbolic representations
- 1.2 Beam reactions at supports
- 1.3 Determinate and indeterminate structures

2.0 Axial, Shearing Forces and Bending Moments 6

- 2.1 Definitions of forces
- 2.2 Plotting shearing force and bending moment diagrams
- 2.3 the superposition of shearing forces and bending moments
- 2.4 maximum shearing force and bending moment and their position
- 2.5 calculation of bending moments from shearing force

3.0 Centric of Plane Elements 3

- 3.1 Centre of gravity and determination of centre of gravity of built-up plane figures
- 3.2 Determinations of axes of symmetry
- 3.3 Determination of centre of gravity of built -up standard steel sections

4.0 Moment of Inertia 3

- 4.1 Definition and units of moment of inertia
- 4.2 Linear and polar moment of inertia
- 4.3 Determination of moment of inertia of standard and built-up sections
- 4.4 Definition and determination of radius of gyration

5.0 Stress and strains 4

- 5.1 Definition of stresses and strains
- 5.2 Relationship between stresses and strains
- 5.3 Types and characteristics of stress, ultimate stress, allowable stress and safety factor, stress concentration
- 5.4 Elastic and plasticity behavior of solids under various stress

6.0 Stress and Strain Analysis 4

- 6.1 Hooke's law, modulus of elasticity, Poisson's ratio and modulus of elasticity
- 6.2 Principal stresses and their relationship to normal and shear stress
- 6.3 Mohr's circle for stress and strain
- 6.4 Effect of temperature on stresses

7.0 Thin-Walled Vessels	3
7.1 Definition and characteristics of thin-walled vessels	
7.2 Types of stresses in thin-walled vessels and their calculation	
8.0 Torsion	4
8.1 Definition of Torsion and types of Torsion	
8.2 Calculation of torsional stresses and moments in elements	
9.0 Theory of Flexure	5
9.1 Analysis of beams of symmetric cross- sections	
9.2 Coplanar and pure bending	
9.3 Radius of curvature, flexural stiffness and section modules	
9.4 Elastic and plastic bending	
9.5 Beam deflections	
9.6 Analysis of composite beams	
10.0 Mechanical Properties of Metal	10
10.1 Atomic structure and crystallography of metals	
10.2 Strength, elasticity and hardness	
10.3 Heat treatment and thermal conductivity	
10.4 Fatigue and fracture	
10.5 Commonly used Metals and alloys in electrical equipment	

Laboratory:

There shall be six laboratory exercises to measure the behavior of structural materials tensile and compressive forces on structures, on structures, loads on structures, Material properties in uniaxial tension, direct tension test and simple bending test Torsion test to determine modulus of rigidity, Hokes Law

References:

Beer and Johnson, "Mechanics of Materials", Mc Graw-Hill,1981.

ELECTRICAL ENGINEERING II

Year: II

Semester: I

Teaching Schedule Hours/ Week			Examination Scheme			
Theory	Tutorial	Practical	Internal Assessment		Final	
			Theory	Practical*	Theory**	Practical
3	1	3/2	20	25	80	-

*Continuous

**Duration: 3 hrs

Course Objectives: To provide the basis for formula and solution of network equations and to develop one-port and two port networks with given network.

- 1. Network Analysis (2 hrs)**
1.1 Review of Network: Mesh and Nodal-pair
- 2. Circuit Equations and the solutions: (6 hrs)**
2.1 The differential; operator
2.2 Operational impedance
2.3 Formulation of Circuit differential equations: Complete response (transient and steady state) of first order differential equations with or without initial conditions.
- 3. Circuit Dynamics (6 hrs)**
3.1 First order RL and RC circuit
3.2 Complete response of RL and RC circuit to sinusoidal input
3.3 RLC circuit: Step response of RLC circuits, Response of RLC circuit to sinusoidal inputs, Resonance, Damping factors and Q-factor
- 4. Laplace Transform and Electrical Network solutions: (6 hrs)**
4.1 Definition and properties of Laplace transform of common forcing functions
4.2 Initial and Final value theorem
4.3 Inverse Laplace transform: Partial fraction expansion
4.4 Solutions of first order and second order system, RL and RC circuit, RLC circuit
4.5 Transient and steady-state responses of network to: unit step, unit impulse, ramp and sinusoidal forcing functions
- 5. Transfer functions: (3 hrs)**
5.1 Transfer functions of network system
5.2 Poles and Zeros plot and analysis
5.3 Time-Domain behavior from pole-zero locations
5.4 Stability and Routh's Criteria, Network stability
- 6. Fourier series and transform (3 hrs)**
6.1 Evaluation of Fourier coefficients for periodic sinusoidal and non-sinusoidal waveforms
6.2 Fourier Transform Application of Fourier transforms for non-periodic waveforms
- 7. Frequency response of system (4 hrs)**

- 7.1 Magnitude and phase spectrums
- 7.2 Bode plots and its applications
- 7.3 Half-power point, bandwidth, roll-off, and skirt, Effects of quality factor on frequency response
- 7.4 Concept of ideal and non-ideal LP, HP, BP filters

8. One-port passive network (8 hrs)

- 8.1 Properties of one-port passive network
- 8.2 Driving point functions: Positive real Function, loss-less network synthesis of LC one-port network
- 8.3 Properties of RL and RC network, synthesis of RL and RC network
- 8.4 Properties and synthesis of RLC one-port network

9. Two-port passive network (7 hrs)

- 9.1 Properties of two-port network: Reciprocity and symmetry
- 9.2 Short circuit and open circuit parameters, transmission parameters, Hybrid parameter
- 9.3 Relation and transformations between sets of parameters, Synthesis of two-port LC and RC ladder network.

Laboratory:

1. Transient and steady state responses of first order Passive network
2. Transient and Steady state responses of second order Passive network
3. Measurement of Frequency responses of first order and second order circuits
4. Measurement of Harmonic content of a waveform
5. Synthesis of one-port network function and verify the responses using oscilloscope

References:

1. ME. Van Valkenburg, "Network Analysis", Thrid edition Prentice Hall of India, 1995
2. MI Soni and J.C. Gupta, "A course in Electrical Circuit Analysis", Dhanapat Rai & sons, India
3. KC Ng, "Electrica; Network Theory", A.H. Wheeler & Company (P) limited, India

ELECTRONIC DEVICES

BEG231EC

Year:II

Semester:I

Teaching Schedule Hours/Works			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	3/2	Theory	Practical	Theory	Practical	
			20	25	80	-	125

*Continuous

**Duration : 3 hours

Course Objectives: To understand the basics and working principles of electronic semiconductor devices and to provide the for analysis.

1. Semiconductor Diode: (10hours)

- 1.1 Review of conduction in semiconductors
- 1.2 Theory of p-q junction : Band structure of p-n junction, the p-n junction as a diode, the effects of temperature in V-I characteristics
- 1.3 Space charge or transition region capacitance and its effects: Diffusion capacitance
- 1.4 Diode switching times, Zener diode, tunnel diode, construction
- 1.5 Characteristics, and Applications of schottky diode and Metal Oxide Varister.

2. Bi-polar junction Transistor (BJT): (10hours)

- 2.1 Construction of a BJT
- 2.2 The Embers-Moll equations
- 2.3 Current components
- 2.4 Analytical expression for transistor- characteristics
- 2.5 BJT Switching time, Maximum voltage rating, Avalanche effect, Reach-though
- 2.6 The transistor as an amplifier, CB CE, and CC configurations

3. BJT biasing and Thermal Stabilization: (4hours)

- 3.1 Types of biasing
- 3.2 Bias stability: Bias compensation
- 3.3 Thermal runaway and stability

4. The Small Signal low frequency analysis model of BJT: (5hours)

- 4.1 Low frequency analysis model
- 4.2 Transistor configurations and their hybrid model: measurement of h-parameters
- 4.3 Analysis of a transistor amplifier circuit using h-parameters

5. The High frequency model of BJT: (4hours)

- 5.1 High frequency model (t-model)
- 5.2 Transistor configurations and their high frequency model
- 5.3 High frequency current gain

6. The Junction Field Effect Transistor (JFET): (7hours)

- 6.1 Construction and types
- 6.2 The pinch-off voltage and its importance
- 6.3 Biasing and load line: V-I characteristics of CB, CE, and CC configurations
- 6.4 A generalized FET amplifier: Uni- Junction transistor

7. The Metal Oxide Semiconductor FET: (4hours)

- 7.1 Construction and types
- 7.2 Load line and biasing
- 7.3 V-I characteristics, small model and analysis

Laboratory:

1. Measurement of characteristics of Diode, Zener diode
2. Measurement of input and output characteristics of CB,CE, and CC configurations.
3. Measurement of input and output characteristics of JFET
4. Measurement of input and output characteristics of NMOS
5. Measurement of input and output characteristics of CMOS

References:

1. S. Sedra and K.C.Smith, "Microelectronics Circuits", Holt Rinehart and Winston Inc, New York.
2. M N Horeinstein, "Microelectronic circuit and Devices", Second edition, Prentice Hall of India.
3. J. Milliam and Halkias, "Electronic Device and Circuit", Mc-Graw Hill.