MICROPROCESSOR

BEG233EC

Year:II Semester:II

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Teaching Schedule  Hours/Week | | | Examination Scheme | | | | |
| Theory | Tutorial | Practical | Internal Assessment | | Final | | Total |
| 3 | - |  | Theory | Practical\* | Theory\*\* | Practical | 150 |
| 20 | 50 | 80 | - |

\*Continuous

\*\*Duration: 3hours

**Course Objectives:** The objective of this course is to provide fundamental knowledge to understand the opreation, programming and application of microprocessor.

**1.Introduction: (6hours)**

* 1. Evolution of microprocessor
  2. Calculator and stored program computer
  3. Von Neuman and Harbard architecture
  4. Simple stored program computer architecture
  5. Description of microprocessor architecture and applications

**2. Microprocessor Instructions: (8hours)**

* 1. Register transfer language (RTL)
  2. Instruction and machine cycle
  3. Addressing modes:Direct, indirect immedite, absolute, relative, indexed, register, stack and implied
  4. RTLdesription of data transfer instructions, arithmetic instructions, logical instructions, branch inntructions,and miscellaneous instruction
  5. Fetch and execution cycle, fetch-execution overlap
  6. Timing diagram for register move,indirect read, indirect write and out instruation

**3. Assembly Language Programming: (10hours)**

* 1. Assembler instruction format:Opcodes, mnemonics and operands
  2. Assembler operation:Sample assembly language program and code generation,one pass and two pass assembly
  3. Macro assemblers, linking assembler directives

**4. Bus Structure and Memory Devices: (4hours)**

* 1. Bus structure, synchronous and asynchronous data bus, address bus, bus timing
  2. Static and dynamic RAM,ROM
  3. Programmable read only memory (PROM), ultraviolet electrically programmable memory(UVEPROM) and electrically erasable programmable memory (EEPROM)
  4. SRAM and ROM interface requirements

**5. Input/Output Interfaces: (7hours)**

* 1. Serial communication

5.1.1 .Asynchronous interface: ASCH code, baud rate, start bit, stop bit, parity bit

5.1.2 Synchronous interface

5.1.3 Physical communication standard

5.1.4 8251Aprogrammable communication interface

* 1. Parallel communication
  2. Data transfer wait interface
  3. RS-232 and IEEE488-1978 general purpose interface standard
  4. Keyboard and display controller

**6. Interrupt: (4hours)**

* 1. Introduction, interrupt vector and descriptor table
  2. Interrupt service routine requirements
  3. Interrupt priority:Maskable and non-maskable interrupts, software interrupts, traps and exception
  4. Vectored, chained and polled interrupts structures
  5. Interrupts in parallel and serial interfaces

7. **Multiprogramming: (4hours)**

* 1. Microprogramming, uni programming and multiprogramming
  2. Process management and semaphore
  3. Common procedure sharing
  4. Memory managements and virtual memory

**8. Introduction to Advanced Microprocessor Architecture: (2hours)**

**Laboratory**

12 laboratory exercises using the microprocessor trainer kit and assembler.

**References:**

1. Ghosh,P.k., Sridhar P.R., "0000 to 8085:Introduction to Microprocessors for Engineers and Scientists", Second Edition, Prentice Hall of India Private Limited, 1997.
2. Lance, A. Leventhal., "Introduction to Microprocessors: Software, Hardware, and Programming", Eastern Economy Edition, Prentice Hall of India Private Limited, 1995.
3. Malvino, A.P.." An Introduction to Microcomputers" , Prentice Hall of India Private Limited,1995.

**INSTRUMENTATION I**

**BEG232EC**

Year:II Semester:II

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

**\*Continuous**

**\*\*Duration: 3hours**

**Course Objectives:** To provide fundamental knowledge of instrumentation and measurements.

**1. Introduction: (4 hours)**

* 1. Instrumentation and components of Instrumentation
  2. Transducting, signal conditioning and signal transmission.
  3. Input and output device .
  4. Type of signals

**2. Measurement: (12hours)**

2.1 Units and standards of measurements

2.2 Measuring instruments: Performance parameters, Dynamic parameter

2.3 Resistance measurement with Whetstone bridge

2.4 Inductance and capacitance bridges

2.5 Error in measurement and error type

**3. Variables and Transducers: (10hours)**

* 1. Physical Variables and their types (Electrical, Mechanical, Process, Bio-physical variable)
  2. Types , principle of operation, input and output characteristics and application of transducers (resistive , capacitative, inductive, voltage and currents)
  3. Calibrations and error in transducers

**4. Signal Conditioning and Processing: (10hours)**

* 1. Importance of Signal conditioning and processing
  2. Signal amplification and Filtering
  3. Instrumentation amplifier:Op-Amp in instrumentation
  4. Interference signals and their elimination: shielding and grounding
  5. Signal conversion (Analog-to-Digital, Digital-to-Analog)

**5. Signal Transmission: (7hours)**

* 1. Transmission media and their Types
  2. Transmission scheme: Analog and Digital
  3. Data transmission system and standards

**6. Out put Device: (3hours)**

* 1. Feature of output device
  2. Indication instruments
  3. Data recording system, strip- chart, X-Y display and plotter

**Laboratory:**

1. Measurement of physical variables using various bridges.
2. Conversion of physical variables into electrical signal.
3. Signal conditioning (amplification and filtering).
4. Error measurements in instrumentation system.
5. Observation of interference in instrumentation and their remedy.
6. Conversion of analog signal into digital and digital into analog signal.

**References:**

1. A.D.Helfrick and W.D.Cooper, "Modern Electronic Instrumentation and Measurement Techniques"Prentice Hall of India1996.
2. S.Wolf and R.E.M. Smith, "Student Reference Manual for Electronics Instrumentation Labortaries", Prentice-Hall of India 1996
3. A.K.Sawhney, "Acourse in Electronic Measurements and Instrumentation ", Dhanapat Rai and sons, India, 1998
4. C.S.Rangan , G.R. Sharma,and V.S.V.Main Instrumentation : Devices and System", Tata Mc Graw Hill, India, 1992
5. D.M.Considine, "Process Instruments and Controls Handbooks", MC Graw Hill 1985.

**ELECTRONIC CIRCUIT I**

BEG234EC

Year:II Semester:II

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

\*Continuous

\*\*Duration: 3 hours

**Course Objectives:** To provide fundamental concept of electronics circuits. The course focuses more on understanding of amplifiers, operational amplifier, Oscillator and powe supplies.

**1. Low frequency transistor Amplifier Circuits: (8 hours)**

* 1. Review of low frequency AC and DCmodels,
  2. Amplifier configuration CB,CE, and CC:expression for voltage gains and current gains, expression for input and output impedances
  3. Single stage and multistage amplifiers: n-stage cascaded amplifiers, gain calculation, choice of configurationin a cascaded
  4. Darling on -pair amplifier
  5. Emitter follower amplifier

**2. Unturned amplifiers: (6 hours)**

2.1 Classification of amplifiers

2.2 Design of biasing circuits

2.3 Frequency and phase responses

2.4 RC Coupled amplifiers: frequency response of RC -stage

**3. Large signal amplifiers: (6 hours)**

* 1. Analysis of large signal model
  2. Push -pull amplifiers, transformer coupled push-pull stage
  3. Amplifiers efficiency:power amplifiers, power dissipation and heat sinks

**4. Feedback amplifiers : (8 hours)**

4.1 Negative feedback amplifiers

4.2 Feedback configurations

4.3 Feedback loop stability: bode plot analysis

**5**. **Operational Amplifier Circuits: (6 hours)**

5.1 Input offset voltage

5.2 Input bias and input offset currents

5.3 Output impedance

5.4 Differential and comon- mode input impedances

5.5 DC gain, bandwidth, gain-bandwidth product

5.6 Common-mode and power supply rejection ratios

5.7 Higher frequency poles, settling time

5.8 Slew rate

**6. Oscillator Circuits: (6 hours)**

* 1. Operation amplifier based relaxation oscillators
  2. Voltage-to-frequency converters
  3. Sinusoidal oscillators
  4. Conditions for oscillators
  5. Amplitude and frequency stabilization
  6. Swept frequency oscillators
  7. Frequency synthesizers
  8. Function generators

**7. Power Supplies and Voltage Regulators: (5 hours)**

* 1. Half-wave and full-wave rectifiers
  2. Capacitive filtering
  3. Zener diodes, band gap voltage references, constant current diodes
  4. Zener diode voltage regulators
  5. Series transistor- Zener diode voltage regulators
  6. Voltage regulators with feedback
  7. IC voltage regulations

**Laboratory**

There shall be laboratories exercises on amplifiers, oscillators, and power supplies

**Reference Book**:

1. W. Stanely "Operational Amplifiers with Linear Integrated CIRCUITS",Charles E. Merrill Publishing

Company, Toronto,1984.

1. J. G.Graeme, "Application of Amplifiers: Third Generation Technique" The burr-Brown Electronic Series, Mc Graw -Hill, New York,1973
2. P.E.Allen and D.R.Holberg, "COMS Analog Circuit Design", Holt, Rinehart and Winston, Inc., New York,1987
3. A. S. Sedra and K.C. Smith,"Microelectronic Circuits", 2nd Edition, Holt, Rinehart and Winston, Inc., NewYork .

ELECTROMAGNETICS

BEG235EC

Year:II Semester:II

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

\*Continuous

\*\* Duration: 3hours

**Course Objectives:** The objectives of this course is to provide the knowledge to understand the fundamental laws of static and dynamic electric and magnetic fields and apply electromagnetic fields and waves theory in the generation, transmission and measurement techniques.

**1. Introduction: (3hrs)**

* 1. Scalars and vectors
  2. Vector algebra
  3. Coordinate system
  4. Scalar and vector operations in different coordinate systems

**2. Coulomb's Law and Electric Field Intensity: (3hrs)**

2.1 Coulomb's law

2.2 Electric field intensity

2.3 Field due to point charges and continuous charge distribution

2.4 Field of a line charge and sheet of charge

**3. Electric Flux Density and Gauss's Law: (2hrs)**

* 1. Electric flux density
  2. Gauss' s law in integral form
  3. Application of gauss' s law
  4. Boundary condition at a conductor surface

**4. Divergence: (2hrs)**

* 1. Concept of divergence
  2. Maxwell's first equation and applications
  3. Vector operator
  4. Divergence theorem and application

**5. Energy and Potential: (3hrs)**

5.1 Electric energy

5.2 Potential and Potential difference

5.3 Potential field of a point charge and system of charges

5.4 Potential gradient

5.5 Electric intensity as the negative gradient of a scalar potential

5.6 Conservative fields

5.7 Electric energy density

**6. Electrostatic Field in Material Media: (2hrs)**

6.1 Polarization

6.2 Free and bound charge densities

6.3 Relative permittivity

6.4 Capacitance calculations

**7. Boundary Value Problems in Electrostatics: (5hrs)**

* 1. Laplace's and Poisson's equations
  2. Uniqueness th0eorem
  3. One-dimensional and two-dimensional boundary value problems
  4. Relaxation methoda and numerical integration
  5. Graphical field plotting
  6. Capacitance calculations

**8. Current and current density: (2hrs)**

* 1. Conversation of charge
  2. Continuity of current
  3. Point form of Ohm's law
  4. Relaxation time constant

**9. Magnetostatics: (3hrs)**

* 1. Biot-Savart's law
  2. point form Magnetic intensity and magnetic induction
  3. Ampere's circuital law
  4. Applications

**10. Curl: (3hrs)**

* 1. Introduction
  2. Stoke's theorem
  3. Magnetic flux and magnetic flux density
  4. Ampere's law in point form
  5. Scalar and vector magnetic potentials
  6. Derivation of steady magnetic field laws
  7. Boundary value problems

**11. Magnetic force and material: (1hr)**

* 1. Magnetic force
  2. Magnetization and permeability
  3. Magnetic boundary condition
  4. Magnetic circuits

**12. Time- Varying fields and Maxwell's Equations: (3hrs)**

* 1. Faraday's law
  2. Inadequacy of Ampere's law with direct current
  3. Conflict with continuity equation
  4. Displacement current
  5. Maxwell's equation in point form, Maxwell's equation in integral form
  6. Retarded potential

**13. Wave Equation: (8hrs)**

* 1. Wave motion in free space, perfect dielectric, and lossy medium
  2. Wave impedance, Skin effect, A..C..resistance
  3. Poynting vector
  4. Reflection and transmission coefficient
  5. Standard wave ratio
  6. Impedance matching
  7. Radiation from a dipole antenna
  8. Wave guides

**14. Transmission Lines: (4hrs)**

* 1. Types of transmission mediums
  2. Characteristics impedance
  3. Power and signal transmission capability of lines
  4. Field and lumped circuit equivalents
  5. Traveling and standing waves, reflection, termination, and impedance matching
  6. Short and long lines
  7. Graphical solution of transmission lines

**15. Introduction to Microwaves: (1hr)**

**Laboratory**

Six laboratory exercises to demonstrate the concept of electromagnetics and using simulation software.

**References:**

1. W.H. Hayt, "Engineering Electromagnetic", Tata McGraw-Hill Book Company, New Delhi.
2. J.D. Kraus and K.R.Carver, "Electromagnetics"

**ELECTRICAL MACHINE AND DRIVES**

BEG224EL

Year:II Semester:II

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

\*\* Duration: 3 hours

**Course Objectives:** The Course objective is to apply the principles of electric and magnetic electric and magnetic circuits for electromechanical energy conversion. Able to understand the principles of rotating and non- rotating electrical machines.

**1. Introduction: (3hrs)**

* 1. Magnetic circuits and Ampere s law
  2. Ferromagnetic materials: magnetic saturation, non-linearity, hystersis
  3. Types of magnetic circuit
  4. Effect of dc and ac, hysteresis and eddy currents, energy losses and laminations
  5. Self andmutual inducances
  6. Electromagnets

**2. Transformers: (6hrs)**

* 1. Magnetically coupled circuits
  2. Effects of secondary current in ideal transformer
  3. Transformer reactances and equivelent circuits
  4. Air core vs iron core transformers
  5. Losses in transformer, opencircuiy and short circuit tests
  6. Series and parallel connection of winding
  7. Audio transformer, power transformers, auto transformers and instrumentation transformers
  8. Three phase transformers

**3. DC Machines: (4hrs)**

* 1. Construction of dc machine
  2. Magnetic circuit, air-gap flux pattern and its effects
  3. Torque production and voltage generation
  4. Armature winding:lap and wave windings
  5. Field excitiation: shunt, series and compound fields
  6. Armature rection
  7. Commutation, interpoles
  8. Losses, cooling, rating and heating

**4. DC Motors: (5hrs)**

4.1Torque/ speed characteristics of shunt, series and compound field motors

4.2Armature reaction and motor operation

4.3Communication problems, pole face compensating windings

4.4Speed regulation and control in dc motors

4.5Effectof field excitation and armature voltage

4.6Reverse rotation

4.7Starting and speed control of motors, armature voltage and shunt field control

**5. DC Generators: (4hrs)**

* 1. Voltage/ Speed/ load characteristics
  2. Shunt,series and compound field machines
  3. Seperate and self-excited machines, voltage build-up in self excited generators
  4. Automatic voltage regulation

**6. Synchronous and induction machines: (6hrs)**

* 1. Flux and MMF waves in synchronous machine
  2. Salient pole and cylindrical rotor structures
  3. Open-circuit and short-circuit characteristics
  4. Genreator voltage regulation with real and reactive power loads
  5. Generators synchronization, load and power factor control, torque angle
  6. Synchronous motor: equivalent circuit, starting, V-curves, variable power factor,torque angle, load limits

**7. Fractional Horsepower (fhp) Drives: (6hrs)**

* 1. Single phase AC motors: split phase, capacitor start/ run, shaded pole
  2. Servo-type motors and their drivers
  3. Stepper motors and electronic drivers
  4. Permanent magnet DC and AC motors
  5. AC synchro system for servo applications

**8. DC Drives: (5hrs)**

* 1. Static variable DC voltage drives using diode and controlled rectifier
  2. 2-quadrant reversible voltage drives
  3. 2-quadrant reversible voltage and power floe drives

**9. AC Drives: (6hrs)**

* 1. Scharge variable speed motor
  2. Soft-start AC starter-controller for induction motors
  3. Variable frequency supplies for AC drives: rotating synchronous and induction generators, pulse width

modulated supplies and cycle- convertors

**Laboratory:**

1. Study of reversible DCmotor drive system
2. Study of PWM controller for an AC machine

**References:**

1. E.Fitzgerald, C.Kinsley, and S. Dumans, "Electric Machinery" Tata Mc Graw-Hill India Limited,1984.
2. M.G.Say,"A.C. Machines"

**APPLIED MATHEMATICS**

BEG204HS

Year:II Semester:II

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Teaching Schedule Hours/Week | | | Examination Scheme | | | | |
| Theory | Tutorial | Practical | Internal Assessment | | Final | | Total |
| 3 | - | - | Theory | Practical\* | Theory\*\* | Practical | 100 |
| 20 | - | 80 | - |

\* Continuous

\*\* Duration: 3 hours

**Course Objectives:** The aim of this course is to expose students to theory of complex variables, Fourier and Z-transforms applied to signal processing. The course also impacts the fundamentals knowledge on Wave and Diffusion equations with coordinate system

**1. Complex Variables (6hours)**

* 1. Function of Complex Variables
  2. Taylor Series, Laurent Series
  3. Singularities, Zeros and Poles
  4. Complex integration
  5. Residues

**2. Z-Transforms (12hours)**

* 1. Definition of Z-Transform
  2. One sided and two sided transform
  3. Linear Time Invariant Systems,rssponse to the unit spike
  4. Properties of Z-Transform
  5. Region of Convergence, relation to casulaty
  6. Difference equation and solutions of difference equations, Representation of System Transfer Function

in Z-domain

* 1. Inverse Z-Transform
  2. Parseval s Theorm

**3. The Fourier Series, Integral and Transform (15hours)**

* 1. Periodic Functions, even and odd functions
  2. Fourier series for arbitrary range and for complex function
  3. Magnitude and phase spectra
  4. The Fourier Integral, the inverse Fourier Intrgral
  5. Fourier sine and cosine transforms,
  6. Forward and Inverse Fourier transforms
  7. Magnitude, energy and phase spectrum

**4. Partial differential equations (8hours)**

* 1. Wave equation
  2. Diffusion equation
  3. Laplace equation in two and three diminsions
  4. Polar,Cylindrical and Spherical cocrdinates

**5. Linear Programming (4hours)**

* 1. Simplex method
  2. Canonical forms
  3. Optimal values

**References**

1. E.Kreyszig,"Advanced Engineering Mathematics ",Wiley,US
2. J.G.Proakis and D.G.Manolakis, "*Digital Signal Processing*", Prentice Hall of India

APPLIED SOCIOLOGY

BEG395MS

**Year: II Semester:II**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Teaching  Schedule  Hours/  Week | | | Examination Scheme | | | |  | | Total Marks | Remarks |
| Final | | | | Internal Assessments | |  |  |
| Theory | | Practical | | Theory | Practical |
| L | P | T | Duration | Marks | Duration | Marks |  |  |  |  |
| 3 | 0 | 0 | 3 | 80 |  |  | 20 |  | 100 |  |

**1. Introduction: (4hours)**

* 1. Definition of sociology
  2. Evolution of sociology
  3. Relationship of sociology with other social sciences
  4. Application of sociology in addressing contemporary issues

**2. Language of sociology: (14hours)**

* 1. Society and Culture
  2. Tribe, Caste &Ethnicity
  3. Community and Institutions
  4. Homogenous &Heterogeneous
  5. Norms and Values
  6. Co-operation &Conflict
  7. Status & Roles
  8. Competition & Conflict
  9. Association and Group

**3. Fundamental concepts in sociology: (14hours)**

* 1. Social system
  2. Social structure: family, caste and ethnic group, religions festivals
  3. Social process
  4. Socialization
  5. Social and Cultural change
  6. Social stratification
  7. Social problem and social control

**4. Nepalese Culture and Society: (12hours)**

* 1. Historical ideological and political dimension of Nepalese culture and society
  2. Caste system in Nepal
  3. Ethnic groups and inter relationship among them
  4. Religions and festivals in Nepal
  5. Social stratification in Nepalese Societies on the basis of Caste, gender, Ethnicity and Age

**5. Community Development: (16hours)**

* 1. Meaning
  2. Nature and History
  3. Development Approaches
  4. Community organizing for people's empowerment
  5. Communications and community Education
  6. Community mobilization
  7. Indigenous and appropriate Technology
  8. Ecology and Environment
  9. Community participation in development activities
  10. Gender differences and role of Women in energy conservation & development, social cycle Modernization and Globalization
  11. Application of knowledge of sociology with special reference energy, policy, legal issues and practices, identification of issues & resolution

**Recommended Books:**

* Inkels Alex, "What is Sociology? Introduction in the discipline and profession, Prentice Hall of India"
* Foster G.M. ,"Traditional Culture and impact of Technological Change"
* Mair L.,"Applied Sociology, Anthropology"
* Gsanlender A.W., "Applied Sociology opportunity and Problems"
* Regmi Rishikeshav Raj " Dimenshion of Nepali society and Culture"
* Gurung Sant Bahadur:"Rural Develoment Approach in Nepal" Deva Publications Kathmandu