Digital Logic

Course Code.....

Lecture : 3 Year : 1
Practical : 3 Part : I

Course Objectives:

To introduce basic principles of digital logic circuits, their implementation and applications.

1. Introduction (2 hours)
   - 1.1. Digital versus Analog Signals
   - 1.2. Logic Level Diagram
   - 1.3. Digital Integrated Circuits (ICs)
   - 1.4. Clock Triggering Systems
   - 1.5. Digital System Applications
2. Digital Codes and Conversions (4 hours)
   - 2.1. Binary, Octal and Hexadecimal Codes
   - 2.2. BCD Code
   - 2.3. Excess-3 Code
   - 2.4. Gray Code
   - 2.5. ASCII and EBCDIC Codes
   - 2.6. Code Conversions
3. Logic Gates (4 hours)
   - 3.1. Basic Gates and Equivalents
   - 3.2. Universal Gates and Equivalents
   - 3.3. Exclusive Gates and Equivalents
   - 3.4. Positive and Negative Logic
   - 3.5. Introduction to 74XX and 74CXX ICs
   - 3.6. De'Morgan's Laws
   - 3.7. Applications of Universal Gates
4. Combinational Logic (6 hours)
   - 4.1. Boolean Algebra and Its Laws
   - 4.2. Simplifications of Boolean Expressions
   - 4.3. Truth Tables and Karnaugh Map
   - 4.4. Cell, Pairs, Quads and Octets
   - 4.5. Rolling, Envelop Effects and Redundant Groups
   - 4.6. Don't Care Conditions
   - 4.7. Minterms and Maxterms
   - 4.8. Sum-of- Product and Product-of-Sum Methods

5. Combinational Logic Circuits (6 hours)

5.1. Design Procedures
• 5.2. Half-Adder and Half-Subtractor
5.3. Full-Adder and Full-Subtractor
5.4. Fast Adders and Serial Adders
5.5. Multiplexers and Demultiplexers
5.6. Encoders and Decoders
5.7. BCD-to-Decimal Decoders
5.8. Seven-Segment Decoders
5.9. Magnitude Comparators
5.10. Their Types and Applications

6. Sequential Logic Circuits (5 hours)

6.1. Latches and Flip-Flops
6.2. Excitation Tables
6.3. Characteristic Equations
6.4. Flip-flop Timing Diagrams
6.5. Flip-Flops as State Machines
6.6. Flip-Flop Conversions
6.7. Flip-Flop Classifications as Triggering
6.8. Flip-Flop Applications

7. Registers and Counters (6 hours)

7.1. Register Types
7.2. srso, SIPO, PISO and PIPO Registors
7.3. Data Transfer Timing Diagrams
7.4. Asynchronous Counter Design
7.5. Asynchronous Up, Down, Up/Down and Mod-Counters
7.6. Decade/BCD Counters
7.7. Synchronous Counter Design
7.8. Synchronous Up, Down, Up/Down and Mod-Counters
7.9. Counter Applications

8. Sequential Machines (6 hours)

8.1. Design Procedure
8.2. Synchronous Machine with Single Input
8.3. Synchronous Machine with Multiple Inputs
8.4. Mealy and Moore Machines
8.5. Sequential Machine Applications

9. Memory Devices (4 hours)

9.1 Flip-Flop as a One-bit Memory Device
9.2 Random Access Memory (RAM)
9.3 Read Only Memory (ROM)
9.4 Programmable Array Logic (PAL)
9.5 Programmable Logic Array (PLA)

9.6 Memory Device Applications

10. Digital Devices Applications (2 hours)
    - 10.1. Multiplexing Displays
    - 10.2. Frequency Counters
    - 10.3. Time Measurements

Practical:

1. DeMorgan's Law and its Familiarization with NAND and NOR Gates
2. Encoder, Decoder and Multiplexer
3. Familiarization with Binary Addition and Subtraction
4. Construction of True Complement Generator
5. Latches, RS, Master-Slave and T Type Flip-Flops
6. D and JK Type Flip-Flops
7. Shift Register Circuits Examples
8. Ripple Counter and Synchronous Counter
8. Familiarization with Computer Package for Logic Circuit Design
9. Digital Design Circuits using Hardware and Software Tools
10. Use of PLAs and PLDs

References:

1. T. Floyd , "Digital Fundamentals", John Willy & Sons Pvt. Ltd., 6th Edition, 2006.
2. M. M. Mano, "Digital Design", McGraw-Hill Publication, Delhi, 4th Edition 2007.
3. Donald P. Leach, Albert P. Malvino and GoutamSaha, "Digital Principles and Aoplications," 7th Edition, Tata McGraw-Hill, 2012.
4. David J. Comer, "Digital Logic and State Machine Design", 3 rd Edition, Oxford University Press, 2002.
5. William I. Fletcher, "An Engineering Approach to Digital Design", Printice Hall of India, New Delhi, 1990.

6 William H. Gothmann, "Digital Electronics, Introduction to Theory and Practice ,, , 2 nd Edition, PHI, 2009.

ELECTRIC CIRCUITS AND MACHINES

EE .....

Lecture 4 Year: 1 Tutorial: 1 Part : 11 Practical : 3/2

Course Objectives:

To continue work in Basic Electrical Engineering including transient analysis and electric machines.

1. Network Analysis of AC circuit & dependent sources hours)
   - 1.1 Mesh Analysis
   - 1.2 Nodal Analysis
   - 1.3 Series & parallel resonance in RLC circuits
     - 1.3.1 Impedance and phase angle of series Resonant Circuit
     - 1.3.2 Voltage and current in series resonant circuit
     - 1.3.3 Band width of the RLC circuit.
     - 1.3.4 High-Q and Low-Q circuits

2. Initial Conditions (2 hours)
   - 2.1 Characteristics of various network elements
   - 2.2 Initial value of derivatives
   - 2.3 Procedure for evaluating initial conditions
   - 2.4 Initial condition in the case of R-L-C network

3. Transient analysis in RLC circuit by direct solution (10 hours)
   - 3.1 Introduction
   - 3.2 First order differential equation
   - 3.3 Higher order homogeneous and non-homogeneous differential equations
   - 3.4 Particular integral by method of undetermined coefficients
   - 3.5 Response of R-L circuit with DC, Sinusoidal and Exponential excitations
   - 3.6 Response of R-C circuit with DC, Sinusoidal and Exponential excitations
   - 3.7 Response of series R-L-C circuit with DC, Sinusoidal and Exponential excitations

4. Transient analysis in RLC circuit by Laplace Transform (8 hours)
   - 4.1 Introduction
   - 4.2 The Laplace Transformation
   - 4.3 Important properties of Laplace transformation
   - 4.4 Use of Partial Fraction expansion in analysis using Laplace Transformations
   - 4.5 Heaviside's partial fraction expansion theorem
   - 4.6 Response of R-L circuit with DC, Sinusoidal and Exponential excitations
   - 4.7 Response of R-C circuit with DC, Sinusoidal and Exponential excitations
   - 4.8 Response of series R-L-C circuit with DC, Sinusoidal and Exponential excitations
   - 4.9 Transfer functions Poles and Zeros of Networks

5. Two-port Parameter of Networks (6 Hours)

5.1 Definition of two-port networks
5.2 Short circuit admittance parameters
5.3 eircuits impedance parameters
5.4 Transmission Short circuit admittance parameters
5.5 Hybrid parameters
5.6 Relationship and transformations between sets of parameters
5.7 Application to filters
5.8 Applications to transmission lines
5.9 Interconnection of two-port network (Cascade, series, parallel)

6. Magnetic Circuits and Induction (4hours)

6.1 Magnetic Circuits
6.2 Ohm's Law for Magnetic Circuits
6.3 Series and Parallel magnetic circuits
6.4 Core with air gap
6.5 B-H relationship (Magnetization Characteristics)
6.6 Hysteresis with DC and AC excitation
6.7 Hysteresis Loss and Eddy Current Loss
6.8 Faraday's Law of Electromagnetic Induction, Statically and Dynamically Induced EMF
6.9 Force on Current Carrying Conductor

7. Transformer (8 hours)

7.1 Constructional Details, recent trends
7.2 Working principle and EMF equation
7.3 Ideal Transformer
7.4 4No load and load Operation
7.5 Operation of Transformer with load
7.6 Equivalent Circuits and Phasor Diagram
7.7 Tests: Polarity Test, Open Circuit test, Short Circuit test and Equivalent Circuit Parameters
7.8 Voltage Regulation
7.9 Losses in a transformer
7.10 Auto transformer: construction, working principle and Cu saving

8. DC Machines (8 hours)

8.1 Constructional Details and Armature Winding
8.2 Working principle of DC generator and EMF equation
8.3 Working principle of DC motor and Torque equation

8.4 Back EMF

8.5 Method of excitation, Types of DC motor

8.6 Performance Characteristics of D.C. motors

8.7 Starting of D.C. Motors: 3 point and 4 point starters

8.8 Speed control of D.C. motors: Field Control, Armature Control

8.9 Losses and Efficiency

9. AC Motors (8 hours)

9.1 Three phase induction motor- construction, operating principle and toraue speed characteristics

9.2 Single phase Induction Motors: Construction and Characteristics

9.3 Double Field Revolving Theory

9.4 Split phase Induction Motor

9.3.1 Capacitors start and run motor

9.3.2 Reluctance start motor

9.5 Alternating Current Series motor and Universal motor

9.6 Special Purpose Machines: Stepper motor, Schrage motor and Servo motor

Practical:

1. Resonance in RLC series circuit - measurement of resonant frequency

2. Transient Response in first Order System passive circuits - measure step and impulse response of RL and RC circuit using oscilloscope - relate time response to analytical transfer functions calculations

3. Transient Response in Second Order System passive circuits - measure step and impulse response of RLC series and parallel circuits using oscilloscope - relate time response to transfer functions and pole-zero configuration

4. Two Winding Transformers

   To perform turn ratio test

   To perform open circuit (OC) and short circuit (SC) test to determine equivalent circuit parameter of a transformer and hence to determine the regulation and efficiency at full load

5. DC Motor

   Speed control of DC Shunt motor by (a) armature control method (b) field control method

   To observe the effect of increasing load on DC shunt motor's speed, armature current, and field current.

6. Single Phase AC Motors
   - To study the effect of a capacitor on the starting and running of a single-phase induction motor
   - Reversing the direction of rotation of a single phase capacitor induct

References:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2010.
2. William H. Hyat. Jr. & Jack E. Kemmerly, "Engineering Circuits Analysis", McGraw Hill International Editions, Electrical Engineering Series, 1987.
3. Michel D. Cilletti, "Introduction to Circuit Analysis and Design", Holt, Hot Rinehart and Winston International Edition, New York, 1988.
4. P.C.Sen, " Principles of Electric Machines and Power Electronics", Wiley.
5. I.J. Nagrath & D.P.K0thari," Electrical Machines", Tata McGraw Hill
6. S. K. Bhattacharya, "Electrical Machines", Tata McGraw Hill
7. B. L. Theraja and A. K. Theraja, "Electrical Technology (Vol-ll)", S. Chand
8. Husain Ashfaq ," Electrical Machines", DhanpatRai& Sons
9. A.E. Fitzgerald, C.KingsleyJr and Stephen D. Umans,"Electric Machinery", Tata McGraw Hill
10. B.R. Gupta &VandanaSinghal, "Fundamentals of Electrical Machines, New Age International
11. P. S. Bhimbra, "Electrical Machines"' Khanna Publishers
12. Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.
13. M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
14. Bhag S. Guru and Huseyin R. Hizirogulu, "Electric Machinery and Transformers" Oxford University Press.

Instrumentation

EX.....

Lecture: 4 Year: 11

Tuiorial: 1 Part: 1

Practical: 3

Course objectives:

To provide the basic concept of instrumentation and knowledge of microprocessor based instrumentation system to interface different kinds of peripherals, circuit design techniques and instruments for a wide range of measurement problems

1. Instrumentation System (2 hours)
   - 1.1 Analog and Digital Signals and Systems
   - 1.2 Instrumentation System: Definition, Block Diagram, Component Descriptions
   - 1.3 Need of Electrical, Electronics, Pneumatic and Hydraulic Working Media Systems and Conversion Devices

2. Theory of Measurement (6 hours)
   - 2.1 Static Performance Parameters: Accuracy, Precision, Sensitivity, Resolution, Linearity
   - 2.2 Dynamic Performance Parameters: Frequency Response, Bandwidth, Response Time
   - 2.3 Errors in Measurement and Their Statistical Analysis
   - 2.4 Measurement of Voltage and Current (Moving Coil and Moving Iron Instruments)
   - 2.5 Measurement of Resistance (Low, Medium and High)
   - 2.6 AC Bridge (Wheatstone Bridge, Maxwell's Bridge, Schering Bridge)

3. Transducer (8 hours)
   - 3.1 Introduction and Classification
   - 3.2 Application of Transducers:
     - 3.2.1 Measurement of Mechanical Variables — Displacement, Strain, Velocity, Acceleration, Vibration
     - 3.2.2 Measurement of Process Variables — Temperature, Pressure, Level, Fluid
     - 3.2.3 Measurement of Bio - Physical Variables — Blood Pressure, Mayo Electric Potential

4. Microprocessor Base System (2 hours)
   - 4.1 Basic Features, Advantages and Disadvantages of Microprocessor Based Instrumentation System
   - 4.2 Types: Open — Loop and Closed — Loop
   - 4.3 PC Interfacing Techniques
   - 4.4 Review of Address Decoding, Mapping I/O and Interfacing of I/O Ports and Memories

5. Parallel Interfacing with Microprocessor Based System (6 hours)
   - 5.1 Methods of Parallel Data Transfer: Simple I/O, Simple Strobe I/O, Single & Double Handshake

     1/0
   - 5.2 8255 as a General Purpose Programmable Peripheral Device: Block Diagram, modes of Operation, Generating control Words

5.3 Interfacing Examples — I/O Ports, Keyboard, Printer, Seven Segment Display etc
5.4 Introduction to ISA and PCI Bus

6. Serial interfacing with Microprocessor Based System (6 hours)
   6.1 Advantages and Disadvantages of Serial Transfer on Parallel
   6.2 Basic Concepts in Serial I/O
      6.2.1 Interfacing Requirements
      6.2.2 Alphanumeric Codes
      6.2.3 Transmission formats: Synchronous & Asynchronous, Simplex & Duplex, Rate of Transmission
      6.2.4 Error and Error Checks in Data Communication
      6.2.5 Data Communication over Telephone Lines
      6.2.6 Standards in Serial 1/0: RS 232, RS 422, RS 423
      6.2.7 Interfacing Examples
7. Interfacing ADC and DAC (5 hours)
   7.1 DAC: Characteristics, Weighted Resistor Type, R — 2R Ladder Type
   7.2 ADC: Characteristics, Successive Approximation Type, Ramp Type, Dual — Slope Type, Flash Type
   7.3 Interfacing Different DAC and ADC to Microprocessor
   7.4 Errors in ADC and DAC
8, Data Acquisition System (2 hours)
   8.1 Data Acquisition system
   8.2 Data Loggers
   8.3 Data Archiving and Storage
   8.4 Bluetooth Devices and Characteristics
9. Grounding and Shielding (4 hours)
   9.1 Outline for Grounding and Shielding, Safety
   9.2 Noise: Sources, Energy Coupling Mechanisms, Prevention
   9.3 Grounding: Single Point Grounding, Ground Plane and Ground Loop
   9.4 Filtering: Bandwidth Minimization, Ferric Beads, Decoupling Capacitors, Line Filters, Isolators and Transient Suppressors
   9.5 Shielding: Definition and Types
   9.6 Protecting Against Electrostatic Discharge
   9.7 General Rules for Design
10. Circuit Design (3 hours)
   10.1 Converting Requirement into Design
   10.2 Reliability and Fault Tolerance
   10.3 High Speed Design: Bandwidth, Decoupling, Ground Bounce, Cross Talk, Impedance Matching, Timing
   10.4 Low Power Design
   10.5 Reset and Power Failure Detection

11. Circuit Layout (3 hours)
    - 11.1 Circuit Boards and PCBs
    - 11.2 Component Placement
    - 11.3 Routing Signal Traces: Trace Density, Common Impedance, Distribution Signals and Returns, Transmission Line Concerns, Trace Impedance and Matching, Avoiding Crosstalk
    - 11.4 Grounds, Returns and Shields
    - 11.5 Connectors and Cables
    - 11.6 Testing and Maintenance

12. Software for Instrumentation System (3 hours)
    - 12.1 Types of Software, Selection and Purchase
    - 12.2 Different Software Models with Metrics, Advantages and Limitations
    - 12.3 Risk Abatement and Failure Prevention: Issues, Development Plan, Safety and Reliability,
      Fault Tolerance
    - 12.4 Software Bugs and Testing
    - 12.5 Good Programming Practice

13. Electrical Equipments (4 hours)
    - 13.1 Wattmeter: Types and working principle
    - 13.2 Energy Meter: Types and working principle
    - 13.3 Frequency Meter: Types and working principle
    - 13.4 Power Factor Meter: Types and working principle

14. Case Study (6 hours)

    Examples chosen from local industrial situations with particular attention paid to the basic measurement requirements, accuracy and specific hardware employed environmental conditions der which the instruments must operate, signal processing and transmission, output devices:

ii) Instrumentation for wire and cable manufacturing and bottling plant iii) Instrumentations for a beverage manufacturing and bottling plant iv) Instrumentations required for a biomedical application such as a medical clinic or hospital

v) Other industries can be selected with the consent of the subject teacher or needs

Practical:

1. Use of resistive, inductive & inductive transducers and other types of transducers
2. Review of assembly programming and simple I/O interfacing with 8255
3. Interfacing of LEDs, Seven Segment Display
4. Interfacing of Motors
5. Interfacing of different types of ADC
6. Interfacing of different types of DAC
7. Small Group Project: Design of simple microprocessor based instrumentation system

References:

1. D. V. Hall, "Microprocessor and Interfacing, Programming and Hardware", Tata McGraw Hill
2. Ramesh S. Goankar, "Microprocessor Architecture, Programming and Application with 8085", Prentice Hall
3. K. R. Fowler, "Electronic Instrument Design: Architecting for the Life Cycle", Oxford University Press
4. Jan Axelson, "USB Complete", Penram International Publishing
5. A. K. Sawhney, "A Course in Electronic Measurement and Instrumentation", Dhanpat Rai and Sons
6. J. B. Gupta, "A Course in Electrical and Electronics Measurement and Instrumentation", Kataria and Sons

Object Oriented Software Engineering

Lecture: 3 Year: 111
Tutorial: 1 Part: 11

Practical: 3/2

Course Objectives:

This course aims to give both theoretical and practical foundations on the software engineering and object oriented software engineering and also provide systematic approach planning, development, and managing of object oriented software engineering.

1. Introduction to software and software engineering (5 Hrs).
   - 1.1 Introduction to software engineering
   - 1.2 Software processes and software process models,
   - 1.3 Agile software developments
   - 1.4 Requirements engineering processes,
   - 1.5 System modeling,
   - 1.6 Software prototyping,
   - I .7 Object Oriented software development

2. Object Oriented Concepts and Modeling (8 Hrs)
   - 2.1 Introduction to class, Object, inheritance, polymorphism
   - 2.2 Object Oriented system development
     - 2.2.1 Object Oriented Modeling
     - 2.2.2 Object Oriented System
     - 2.2.3 Function/data Methods
     - 2.2.4 Object Oriented Analysis
     - 2.2 .5 Object Oriented Programming
     - 2.2.6 Object Oriented Construction
   - 2.3 Identifying the elements of an object model
     - 2.3.1 Identifying classes and objects
     - 2.3.2 Specifying the attributes
     - 2.3.3 Defining operations
     - 2.3.4 Finalizing the object definition

3. Structural, Behavioral and architectural Modeling (8 Hrs)
   - 3.1 Classes Relationship,
   - 3.2 Conceptual Model of UML
   - 3.3 Class diagram
   - 3.4 Advanced classes
   - 3.5 Advanced Relationship
   - 3.6 Interface
   - 3.7 Object Diagram
   - 3.8 Interactions
   - 3.9 Use cases
   - 3.10 Use Case Diagram
   - 3.11 Interaction Diagram,
   - 3.12 Activity Diagram State chart Diagram
   - 3.13 Component and Components Diagram 3.14Deployment Diagram

4. Object Oriented Analysis (5 Hrs)

4.1 Iterative Development

4.2 Unified process & UP Phases

4.2.1 Inception

4.2.2 Elaboration

4.2.3 Construction

4.2.4 Transition

4.3 Understanding requirements

5.1 Components of 00 Design model,

5.2 System Design process

5.3 Partitioning the analysis model

5.4 Concurrency and subsystem allocation

5.5 Task Management component

5.6 Object DBMS

5.7 Data Management components

5.8 Resource Management components

5.9 Inter sub-system communication

5.10 Object Design process

6. Object Oriented Testing (6 Hrs)

6.1 Overview of Testing and object oriented Testing,

6.2 Types of Testing,

6.2.1 Unit testing,

6.2.2 Integrating testing,

6.2.3 System testing,

6.2 Object Oriented Testing strategies,

6.3 Test case design for 00 software,

6.4 Inter class test Case design

7. Managing object oriented software engineering (5 Hrs)

7.1 Project selection and preparation,

7.2 Project development, organization and management,

7.3 Software project planning and scheduling and techniques,

7.4 COCOMO model,

7.5 Risk management process,

7.6 Software quality assurance,

7.7 Software metrics

Practical

The practical shall include projects on object oriented system development. Choice of project depend upon teacher and student, case studies shall be included too. References:

1. Ivar Jacobson, Object Oriented Software Engineering, Prentice Hous.
2. Grady Booch, James Raumbaugh, Ivar Jacobson, The United Modeling Language User Guide, Prentice House.
3. Pressman, Software Engineering, MC Graw Hall Education.
4. Sommer Ville, Software Engineering, Person.

Bachelor of Computer Engineering
Bachelor of Electronics, Communication and Information Engineering
Institute of Engineering
HEALTH INFORMATICS (Elective Course)

Lecture: 3 Year: IV

Tutorial: 1 Part: I

Practical: 1.5

Course Objectives:

At the end of the course, the students will have an understanding of the principles, skills, and knowledge required for designing, developing and implementing health information systems and the meaningful use of health data.
The specific learning outcomes are as follows:

- To have insights in purpose, current status, challenges and opportunities in Health information system
- To be able to use health data and exchanges standards in different health information solutions
- To be able to make meaningful use of health data for decision making from patient to policy level.
- To be able to understand ethical, privacy and security issues and data handling methods. To be able to understand the recent trends in public health and clinical data analytics and apply technique to develop simple applications.

Course Contents:

1. Digital Health (6 hours)
   - 1.1. Introduction to Digital health (m-Health, tele-health, and e-Health)
   - 1.2. Digital Health ecosystem
   - 1.3. Overview of digital health technologies
   - 1.4. Digital health strategies
   - 1.5. Major digital health interventions in Nepal and across globe
2. Introduction to Public Health and Healthcare (5 hours)
   - 2.1. Introduction to Health System and Public Health
     - 2.1.1. Principles of public Health and Healthcare
     - 2.1.2. Health Information System (Public Health perspective)
   - 2.2. Challenges and Frameworks for strengthening Health Information System
     - 2.2.1. Current Trends and issues in Public Health - System, Service and Research and role of Informatics (Seminar Style)
     - 2.2.2. Health and Digital Heath Policies of Nepal
3. Health Information Systems (6 hours)
   - 3.1. Introduction to HIS
   - 3.2. Health Information Needs (From Data to Decision)
   - 3.3. Technological perspective of HIS
     - 3.3.1. Electronic Health Record (El-IR), Electronic Medical Record and Personal Health Record
     - 3.3.2. HIS Architectures (PHR, EMR, EHR, mHealth, eHealth)

3.3.3. Online Health services and Pervasive computing in healthcare systems

3.4. HIS systems in Nepal

3.5. Health Information systems design and development

3.6. Public Health Information system technologies (HMIS, Specific Disease Registries, Surveillance systems)

3.7. Quality assurance and system testing

4. Integration and Interoperability (8 hours)

4.1. Integrated Health Information Architecture and its challenges

4.2. Integration of health information systems: Interoperability and standards

4.2. l . Principles of Interoperability and data interchange standards in healthcare Introduction to Ontological standards, XML and Metadata Standardization,

4.2.2. Biomedical Ontologies and UMLS

4.2.3. Terminology Standards (ICD, LOINC, SNOMED CT)

4.2.4. Health Data Exchange Standards (HL7, HL7-FHIR, openEHR, openHIE)

4.3. System and Data integration methods (APIs, ontologies) 4.4. Implementation of Integrated Health Information system

4.5. Open Data in health

4.5. l . Open Data policy, significance and applications

4.5.2. Health Information Privacy and Security

5. Handling Information from Medical Equipment (6 hours)

5.1. Introduction to Bioelectric Signals Measurement and Recording System

5.2. Introduction to Medical Imaging System

5.3. Recording formats

5.3.1. Picture archiving and communication system (PACS)

5.3.2. DICOM

6. Biomedical Telemetry, Telemedicine and Outreach Health services (6 hours)

6.1. Introduction to telemetry and Telemedicine

6.2. Telemetry applications (Diagnostic application, therapeutic applications, rehabilitative applications)

6.3. Types, applications and need of Telemedicine services

6.4. Integration of telemetry and tele-medicine

6.5. Overview of Medical device connectivity technologies (bluetooth, RFID, IR, Li-Fi)

6.6. Internet of Medical Things (IOMT)

6.7. Video conf. system and multimedia data exchange for telemedicine

6.8. Data Management

6.9. Safety and security issues

7. Health data analytics (8 hours)

7.1. Terminology of Analytics

7.2. Introduction to Biostatistics

7.3. The Analytics Pipeline

7.4. Al & Machine learning for Health Data
7.5. Health data Visualization
7.6. Recent trends in Health data analytics

Practical

l . Familiarization and experimentation with health domain data

2. Familiarization and experimentation with Health Information Systems (eg:DHIS2, openMRS, Bahmni, openlMIS, etc.)
3. Familiarization and experimentation with Standard Data exchange formats
4. Practical in systems and heterogeneous information Integrations (APIs)
5. Public Health research design and analysis using EMR data, CDMs, standard vocabularies.
6. Analytics with Health Domain data
7. Visit at least two government health facilities (hospital and a primary health facility) & other non-governmental health facility to observe and also interact with the staffs regarding the opportunities and challenges of improving health data management and prepare a situation assessment report.

At the end of this course, students need to submit a Project report by developing a prototype to solve health domain problems. The students need to discuss health domain experts and work in close collaboration with health domain students.

References:

l . Robert E. Hoyt & Ann K. Yoshihashi, Health Informatics: Practical Guide For Healthcare And Information Technology Professionals, Medical informatics, 6th Edition, 2014
2. Observational Health Data Sciences and Informatics , The Book of OHDSI, 2020
3. Chapman and Hall , Introduction to Computational Health Informatics, CRC Press, 2019
4. R.S. Khandpur, Telemedicine: Technology and Applications (ml-lealth, TeleHealth and eHealth), 2017
5. Aboul Ella Hassanien, Nilanjan Dey & Surekha Borra, Medical Big Data and Internet of Medical Things Advances, Challenges and Applications, CRC Press, 2019

Energy, Environment And Society (Ex 758)

Tribhuvan University
Institute of Engineering
Department of Electronics and Communication Engineering and Computer Engineering

REVISED Curriculum of Subject: EX 758 ENERGY, ENVIRONMENT AND SOCIETY As per New course structure for Bachelor's Degree in Electronics, Communication &

Information and Computer Engineering

(EX701 EES to be replaced by EX 758, Effectivefrom Mangsir 2076)

Subject: Energy, Environment and Society (EX 758) Year: IVPart: 11
Lecture: 2 hours/week
Practical: 0 hr
Tutorial: 0 hr

Effective from: Mangsir 2076 (November 2019) Objective:

After the completion of this course students will understand the applications of various types of energy sources and their environmental impact. This course is also focused on role of engineers for creating well informed and responsible society having access to information.

1. Technology and Development (2hours)
   - 1.1 Introduction to Technology
   - 1.2 Appropriate Technology
   - 1.3 Role of Appropriate Technology in Transformation of Society
   - 1.4 Importance of Technology Transfer
   - 1.5 Impact of technology on Society

2. Energy Basics (4 hours)
   - 2.1 Definition of Energy and Classification of Energy Sources
   - 2.2 Energy Conservation and Efficiency, Energy Mix for National Energy Security
   - 2.3 Importance of Energy in achieving Maslow's hierarchy of Needs, Human Development Index and Energy Consumption
   - 2.4 Current Energy Trends, Demand and Supply of Energy in World and Nepal
   - 2.5 Introduction to Global warming, Clean Development Mechanism, and Sustainability Issues
   - 2.6 Conventional and Non-Conventional/Renewable Energy Sources
   - 2.7 Conventional Energy Sources: Fossil fuel, Nuclear Energy
   - 2.8 Employment of Engineers in non-conventional energy sectors

3. Renewable Energy Sources (6 hours)
   - 3.1 Solar Energy
     - Solar radiation
     - Solar thermal energy
     - Solar Cell (Photovoltaic Technology)
   - 3.2 Hydropower
     - Water sources and power
     - Water turbines and hydroelectric plants
   - 3.3 Hydro Power Plant Classification (based on capacity and operation)
   - 3.4 Wind Energy
     - Availability of Wind Energy sources, wind power calculation
     - Wind turbines, wind parks and power control
   - 3.5 Hydrogen Energy and Fuel Cell
     - Basics of electrochemistry
     - Polymer membrane electrolyte (PEM) fuel cells

4. Application of RE Sources to power Electronic Equipment (8 Hours)
   - 4.1 Simple Design of PV power system to power institutional electrical appliances in remote areas without access to National Grid
   - 4.2 Simple Design of PV power system to power telecommunication equipment such as (BTS and Earth Station installed at remote areas without access to National Grid

5. Environmentally Friendly Application of Solar Electricity for Better Livelihood (3 Hours)
   - 5.1 Application of solar electricity for drinking water pumping in remote areas without access to National Grid
   - 5.2 Application of solar electricity for cooking food in kitchen along with comparisons and Environmental benefits

6. Energy Storage (3 hours)
   - 6.1 Forms of energy storage
   - 6.2 Batteries (Lead acid vs Lai-ion)
   - 6.3 Hybrid and plugin hybrid electric vehicles
   - 6.4 Smart grid systems
   - 6.5 Vehicle to grid (V2G) and grid to vehicle (G2V) systems
   - 6.6 Super-capacitors

7. Environmental Impact of Energy sources(4 hours)
   - 7.1 Emission hazard (GWP of different energy sources. Keith Smith Chart)
   - 7.2 Battery hazard
   - 7.3 Nuclear hazard

References:

- Godfrey Boyle, "Renewable Energy, Power for a sustainable future", Oxford University Press, latest edition
- Aldo V. da Rosa, "Fundamentals of Renewable Energy Processes"