

TELECOMMUNICATIONS

BEG 435 EC

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

* **Continuous**

** **Duration:** 3 hours

Course objectives: The course objective is to give fundamental of telecommunication system.

- 1. Introduction (3 hrs)**
 - 1.1 Evolution of telecommunication
 - 1.2 Structure of telecommunication system
 - 1.3 Simple telephone communication
- 2. Transmission media (10 hrs)**
 - 2.1 Transmission media characteristics
 - 2.2 Transmission line
 - 2.3 Twisted pair, Feeder cable and coaxial cable
 - 2.4 Microwave principle components and communication
 - 2.5 Optical fibre communication
- 3. Signal Multiplexing (4 hrs)**
 - 3.1 Space division multiplex
 - 3.2 Frequency division multiplex
 - 3.3 Time division multiplex
- 4. Switching system (8 hrs)**
 - 4.1 Switching techniques
 - 4.2 Space division switching
 - 4.3 Time division switching
- 5. Subscriber and Signaling in telecommunication (6 hrs)**
 - 5.1 Rotary dial telephone
 - 5.2 Touch tone dial telephone
 - 5.3 Subscriber loop signaling
 - 5.4 Interexchange signaling
 - 5.5 Intraexchange signaling
- 6. Data communication and computer networking (10 hrs)**
 - 6.1 Structure of local area networks
 - 6.2 Local area network protocols
 - 6.3 Network interfaces
 - 6.4 Inter-networking
 - 6.5 Routine and flow control
- 7. Telephone traffic and networks (5 hrs)**
 - 7.1 Fundamentals of telephone traffic
 - 7.2 Telephone network
 - 7.3 Integrated service digital network (ISDN)

Laboratory:

Six laboratory exercises in FDM, TDM, Switching signal transmission in coaxial cable, optical fibre cable, microwave components.

References:

1. M.Schwartz "Telecommunication networks" Addition Wesley.
2. B.E.Briley "An Introduction to telephone switching" Addition Wesley
3. W. Stallings "Local Area Networks" Mc Millan
4. Harold B. Killen "Fibre Optic Communications" Prentice Hall
5. Manuals published by telecom equipment.

DIGITAL SIGNAL PROCESSING

BEG 433 EC

.Year: IV

Semester: II

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

* Continuous

** Duration: 3 hours

Course objectives: To provide

1. **Discrete signals** 5
 - 1.1 Discrete signals – unit impulse, unit step, exponential sequences
 - 1.2 Linearity, shift invariance, causality
 - 1.3 Convolution summation and discrete systems, response to discrete inputs
 - 1.4 Stability sum and convergence of power series
 - 1.5 Sampling continuous signals spectral properties of sampled signals
2. **The discrete Fourier transforms** 5
 - 2.1 The discrete Fourier transform (DFT) derivation
 - 2.2 Properties of the DFT, DFT of non-periodic data
 - 2.3 Introduction of the fast fourier transform (FFT)
 - 2.4 Power spectral density using DFT/FFT algorithms
3. **Z transform** 8
 - 3.1 Definition of Z transform one sided and two sided transforms
 - 3.2 Region of convergence relationship to causality
 - 3.3 Inverse Z transform – by long division, by partial fraction expansion.
 - 3.4 Z transform properties – delay advance, convolution, Parseval's theorem
 - 3.5 Z transform transfer function H (Z) –transient and steady state sinusoidal response pole zero relationships, stability
 - 3.6 General form of the linear, shift invariant constant coefficient difference equation
 - 3.7 Z transform of difference equation.
4. **Frequency response** 4
 - 4.1 Steady state sinusoidal frequency response derived directly from the difference equation
 - 4.2 Pole zero diagrams and frequency response
 - 4.3 Design of a notch filter from the pole zero diagram.
5. **Discrete filters** 6
 - 5.1 Discrete filters structures, second order sections ladder filters frequency response
 - 5.2 Digital filters finite precision implementations of discrete filters
 - 5.3 Scaling and noise in digital filters, finite quantized signals quantization error linear models.
6. **HR Filter Design** 7

- 6.1 Classical filter design using polynomial approximations – Butterworth Chebishev
 - 6.2 HR filter design by transformation matched Z transform impulse, invariant transform and bilinear transformation
 - 6.3 Application of the bilinear transformation to HR low pass discrete filter design
 - 6.4 Spectral transformations, high pass, band pass and notch filters.
- 7. FIR Filter Design 3**
- 7.1 FIR filter design by fourier approximation the complex fourier series
 - 7.2 Gibbs phenomena in FIR filter design approximations, applications of window Functions to frequency response smoothing rectangular hanning Hamming and Kaiser windows.
 - 7.3 FIR filter design by the frequency sampling method
 - 7.4 FIR filter design using the Remez exchange algorithm
- 8. Digital filter Implementation**
- 8.1 Implementations using special purpose DSP processors, the Texas Instruments TMS320.
 - 8.2 Bit serial arithmetic distributed arithmetic implementations, pipelined implementations

Laboratory:

1. Introduction to digital signals sampling properties, aliasing, simple digital notch filter behaviour
2. Response of a recursive (HR) digital filter comparison to ideal unit sample and frequency response coefficient quantization effects.
3. Scaling dynamic range and noise behaviour of a recursive digital filter, observation of nonlinear finite precision effects.

PROJECT COURSE

BEG 439 EC

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
-	-	6	Theory	Practical*	Theory	Practical**	200
				120	-	80	

* Continuous

** Duration: 3 hours

Course objectives: The objective of this project work is to give knowledge on project planning, designing, and reporting and presentation skill. Student should plan and complete an individual electronics engineering design project under the supervision of teacher and prepare project reports.

Procedures:

1. A detailed project proposal not exceeding 10 double spaced pages submitted to the concerned department within two weeks of the start of the project course. The department then will consult possible supervisor for approval of proposal. This proposal will be evaluated by the supervisor. This proposal carry the 10% of project final marks and this marks will be given by the project supervisor.
2. A mid term progress report not exceeding 12 double spaced pages shall be submitted before the end of 8th week of the term. An oral presentation will take place during the 9th week of term. Thus mid term written and oral reports will account for 25% of final marks.
3. Final report minimum of 25 double spaced pages will be submitted at the end of the 15th week of the term. The project supervisor will evaluate this report. This report carry 40% of final marks.
4. An oral presentation of the final report to be conducted during the 16th week of the term by a panel of external examiner. The oral defense carry 25% of the final marks.

INSTRUMENTATION II

BEG 434 EC

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: 3 hours

Course objectives: The objective of this course is to give more enhanced knowledge of instrumentation with emphasis on advanced systems and design. A case study will be carrying out.

1. Testing instrumentation 10

- 1.1 Infrared ultraviolet and x-ray
- 1.2 Mass spectrometry
- 1.3 Nuclear magnetic resonance instruments
- 1.4 Ionizing radiation for instrumentation purpose nuclear radiation for instrumentation purposes
- 1.5 Non destructive testing for industry

2. Microprocessor based instrumentation systems 15

- 2.1 Components of microprocessors based instrumentation
- 2.2 Hardware used in instrumentation
- 2.3 Software for instrumentation and control applications
- 2.4 Programming languages used in microprocessor based instrumentation
- 2.5 Interfacing between analog devices

3. Case studies 20

Case study chosen from local industrial situations with particular attention paid to the instrumentation accuracy, specific hardware employed, environmental conditions under which the instruments must operate signal processing.

Laboratories:

1. Microprocessor structure used for instrumentation
2. Microprocessor programming and coding for instrumentation applications

References:

1. D.M. Considine "Process Instruments and controls handbook", 3rd edition Mc Graw Hill New York 1985.
2. S Wolf and R.F.Smith "Student reference manual for Electronic Instrumentation laboratories" Prentice Hall, Englewood Cliffs, New Jersey, 1990
3. S.E. Derenzo, "Interfacing: A laboratory Approaches Using the microcomputer for instrumentation Data analysis and control" Prentice Hall Englewood Cliffs, New Jersey 1990.

ENGINEERING PROFESSIONAL PRACTICE

BEG 459 CI

Teaching Schedule Hours/Week			Examination Scheme				
Lecture	Tutorial	Practical	Internal Assessment		Final		Total
2	-	-	10		40		50

* Continuous

** Duration: 3 hours

Course objectives: To introduce the ethical and legal environment in which engineering is practiced.

1. **Historical Background** (2 hrs)
 - 1.1 History of engineering practice in eastern society
 - 1.2 History of engineering practice in western society
 - 1.3 Key roles of Engineers in the development activities
 - 1.4 Individual freedoms vs societal goals

2. **Engineering Professionalism** (2 hrs)
 - 2.1 Engineering morals, ethics and professionalism
 - 2.2 Codes of ethics and guidelines for engineering profession
 - 2.3 Relationship of the engineering profession to basic science and technology, relationship to other professions

3. **Engineering professional practice sectors in Nepal** (4 hrs)
 - 3.1 Public sectors: Government organizations like ministries, departments, regional and district offices, corporations, institute of engineering etc.
 - 3.2 General Job description of engineers working in the public sectors
 - 3.3 Private sectors: constructions companies, consulting companies, private Engineering college.
 - 3.4 General Job description of the engineers working in the private sectors

4. **Engineering profession practice in Nepal** (12 hrs)
 - 4.1 The Engineering Council Act 2057
 - 4.2 System of provision for private practice and for employee engineers
 - 4.3 Contract law
 - 4.4 Preparation of Tender Document and Tendering process
 - 4.5 Finalization of Contract documents
 - 4.6 Approval of contract agreement
 - 4.7 Community based engineering project launching procedures
 - 4.8 User's group formation and community participation in development activities.
 - 4.9 Liability and negligence
 - 4.10 Business and labour laws
 - 4.11 Personnel and financial regulations, Tippani system
 - 4.12 Norms adopted for the construction of building, highway, irrigation etc.
 - 4.13 Duties, Responsibilities, Authorities and power delegation system
 - 4.14 Relationship to foreign firms working in Nepal.

5. **Engineering Professional practice in other countries** (2 hrs)
 - 5.1 Other Asian countries
 - 5.2 The USSR and Eastern Europe

- 5.3 Western Europe
- 5.4 North America

6. Issues on engineering professional ethics (8 hrs)

- 6.1 Intellectual property rights: copyrights and patent protection
- 6.2 Personal property and large computerized data bases
- 6.3 Industrialization vs protection of the environment
- 6.4 Risk/benefit considerations in public transportation
- 6.5 Engineers and the military
- 6.6 Science and technology for medicine
- 6.7 Engineers in international development

References:

1. Carson Morrison and Philip Hughes, "Professional Engineering Practice- Ethical Aspects", Mc Graw Hill Ryerson Ltd., Totanto, 1982.