Rashtrasant Tukadoji Maharaj Nagpur University

Formerly Known as Nagpur University

SCHEME OF EXAMINATION FOR
FIFTH SEMESTER BACHELOR OF ENGINEERING

(ELECTRONICS ENGINEERING)

Sub Code	Board	SUBJECT	Work Load				Credit				Marks				
											Theory		Practical		Total Marks
			L	P	T	Total	L	P	T	Total	Internal	University	Internal	University	
BEENE501T	Electronics	Switching Theory &Automata	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE502T	Electronics	Microprocessor & Microcontroller	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE502P	Electronics	Microprocessor & Microcontroller	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE503T	Electronics	Analog Circuits & Design	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE503P	Electronics	Analog Circuits & Design	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE504T	Electronics	Communication Electronics	4	0	1	5	4	0	1	5	20	80	0	0	100
BEENE504P	Electronics	Communication Electronics	0	2	0	2	0	1	0	1	0	0	25	25	50
BEENE505T	Applied Science & Humanities	Industrial Economics & Enterpreneurship Development	4	0	0	4	4	0	0	4	20	80	0	0	100
Total			**20**	**6**	**4**	**30**	**20**	**3**	**4**	**27**	**100**	**400**	**75**	**75**	**650**

Syllabus for
B. E. Fifth Semester (Electronics Engg.)

SWITCHING THEORY & AUTOMATA

Duration: 3
Hrs. College Assessment: 20
Marks University Assessment:
80 Marks

Subject Code: BEENE501T **[4 – 0 – 1 – 5]**

Objectives:

The Course Objectives are:

1. To study designing aspects of digital circuits.
2. To study properties of partially ordered sets & lattices.
3. To study minimization of Booleans function by using K-Map, tabulation method, functional decomposition, symmetric function.
4. To study the diagnosis of switching circuits & methods for improving their reliability.
5. To study various aspects of finite state machines.
6. To elaborate the concept of synthesis of sequential circuits.

Outcome:

After completing this course students shall be able to:

1. Demonstrate basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. Find out structural properties by using Functional Decomposition & Symmetric functions. **3**. Describe designing aspects of logic circuits using threshold elements.
4. Design combinational logic circuits, sequential logic circuits.
5. Describe behavior, capabilities and structure of finite state machines and sequential machines.
6. Describe diagnosis of faults of switching circuits & methods of improving their reliability.

.

UNIT I: Switching algebra and Minimization of switching functions (10)

Switching algebra and functions, Boolean algebra, Boolean functions, K-Map for 6 variables, Minimization of Booleans function using tabulation method, relation and lattices, Venn diagram, sets theory.

UNIT II: Functional decomposition and symmetric functions (08)

Design of combinational logic circuits, contact networks, functional decomposition and symmetric functions.

UNIT III: Threshold logic **(08)**

Threshold logic, threshold elements, capabilities and limitations of threshold logic, elementary properties, unate functions, synthesis of threshold functions, cascading of threshold elements.

UNIT IV: Finite state machine **(12)**

Finite state machine- Moore and Mealy synchronous sequential circuits, Design capabilities, Minimization and transformation of sequential machine, Sequence detector, Design of fundamental mode and pulse mode circuits

UNIT V: Structure of sequential machine **(12)**

Structure of sequential machine, lattice of closed partitions, state assignment using partitions, Reduction of output dependency, Input Independence and autonomous clock, homing sequence, synchronizing sequence, Adaptive Distinguishing experiments.

UNIT VI: Reliable design and fault diagnosis **(10)**

Reliable design and fault diagnosis, fault detection in combinational circuits, fault location experiments, fault detection by Boolean differences, path, sensitizing method, multiple fault detection using map method failure- tolerant design.

BOOKS:

Textbooks:

1. Kohavi ZVI,'Switching and Finite Automata Theory', 2nd Edition, TMH
2. Modern switching theory by S.C.lee

Reference Books:

1. M.Morris Mano,'Digital Design', 3rd Edition, Pearson Education.
2. Donald D.Givone,'Digital principles and Design', TMH.
3. Anand Kumar,' Fundamentals of Digital Circuits' PHI.
4. RP Jain 'Modern Digital Electronics', 2nd Edition, TMH
5. Switching Theory & Logic Design by CVS Rao
6. FUNDAMENTALS OF SWITCHING THEORY AND LOGIC DESIGN, JAAKKO T. ASTO

B. E. Fifth Semester

(Electronics /Electronics & Communication/Electronics & Telecommunication Engg)

MICROPROCESSOR AND MICROCONTROLLERS

Duration: 3
Hrs. College Assessment: 20
Marks University Assessment:
80 Marks

Subject Code: BEENE502T/ BEECE502T/ BETE502T **[4 – 0 – 1 – 5]**

Objectives:

The course objectives are:

1. To study fundamentals of microprocessor and microcontroller systems.
2. To study architecture of microprocessor & to understand the concept of memory organization, stack memory, Assembly language programming.
3. To study different interrupt techniques.
4. To study interfacing of microprocessor & microcontroller with different peripheral devices.

Outcome:

After completing this course students shall be able to:

1. Describe internal organization of 8086/8088 microprocessors & 8051microcontrollers.
2. Describe the concept of addressing modes and timing diagram of Microprocessor.
3. Interface 8086 & 8051 with Keyboard/ Display, ADC/DAC, Stepper motor etc.
4. Demonstrate the concept of interrupts and its use.
5. Demonstrate the concept of Serial & parallel data communication
6. Describe Handshaking concept and interfacing with peripheral devices.
7. Describe the concept of DMA & Pentium.
8. Describe 8087 Numeric coprocessor & its use in practical application.
9. Interface various Hardware with microprocessor.

Unit I: Intel 8086/8088 microprocessor & Programming: (09)

8086/8088 microprocessor, Pin diagram, Architecture, features and operating modes, Clock generator 8284, memory organization & interfacing, Addressing modes, complete instruction set.

Unit II: 8086 & Peripheral Interfacing I: (11)

Assembly language programming of 8086,Interrupt structure, I/O interfacing, Interfacing of peripherals like 8255 PPI, multiplexed 7-seg display & matrix keyboard interface using 8255. Programmable Keyboard/Display controller 8279, Organization, Working modes, command words & interfacing.

(10)

Unit III: 8086 & Peripheral Interfacing II:

Programmable interval timer/counter 8254; Architecture, working modes, interfacing 8259 PIC, Organization, control words, interfacing, cascading of 8259's. Serial communication, Classification & transmission formats. USART 8251, Pins & block diagram, interfacing with 8086 & programming.

Unit – IV: Numeric Co-processor & DMA Controller: (10)

8086 maximum mode pin diagram, Closely coupled & loosely coupled multiprocessor system, 8087 Numeric coprocessor, architecture, interfacing with 8086, instruction set.DMAC 8237, Architecture, interfacing & programming, Introduction to Pentium.

Unit – V: 8051 microcontroller & programming: (10)

Introduction to 8051 microcontroller; Pin diagram, architecture, features & operation, Ports, memory organization, SFR's, Flags, Counters/Timers, Serial ports. Interfacing of external RAM & ROM with 8051.8051 Interrupt structure, Interrupt vector table with priorities, enabling & disabling of interrupts.

Unit – VI: 8051 microcontroller interfacing: (10)

Instruction set of 8051; data transfer, logical, arithmetic & branching instructions, Addressing modes, Assembly language programming examples, counter/timer programming in various modes. Serial communication, Operating modes, serial port control register, Baud rates. I/O expansion using 8255, Interfacing keyboard, LED display, ADC & DAC interface, stepper motor interface.

Books:

Text Books:

1. Programming & Interfacing of 8086/8088, D.V. Hall, TMH.
2. Microprocessor 8086/8088 Family Programme Interfacing: Liu & Gibson.
3. M.A. Mazidi & J.G. Mazidi, the 8051 Microcontroller and Embedded system, 3rd reprint, Pearson Education.

Indian

4. The Intel Microprocessor 8086 & 80486 Pentium and Pentium Pro. Architecture Programming and Interfacing – Brey.

Reference Books:

1. Intel Reference Manuals, Microprocessors Microcontrollers:
   intel 2.Microcontrollers – Peatman, McGraw Hill.
2. Microprocessors & Microcomputers based system design by Md. Rafiquzzaman.
   8086/8088 Microprocessors, Walter Triebel & Avtar Singh
3. Introduction to Microprocessors for Engineers and Scientists,P. K. Ghosh, P. R. Sridhar, PHI Publication.
4. The 8051 Microcontroller & Embeded Systems, Kenneth J. Ayala, Dhanvijay V. Gadre, CENGAGE Learning.

B. E. Fifth Semester
(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

MICROPROCESSOR AND MICROCONTROLLERS

Duration: 2
Hrs. College Assessment: 25
Marks University Assessment:
25 Marks

Subject Code: BEENE502P/ BEECE502P/ BEETE502P **[0 – 2 – 0 – 2]**

Objectives:

1. To perform a practical based on microprocessor and microcontroller based system.
2. To study assembly language programming skills.
3. Interface different peripherals with microprocessor and microcontroller with its use.

Outcome:

At the end of the course the students shall be able to:

1. Demonstrate the concept of Assembly languages structure and programming.
2. Interface various peripherals with 8086 and 8051.
3. Simulate the programs on different software platforms.

Any TEN practicals are to be conducted.

List of Experiments:

1. Study of 8086 microprocessor.
2. Write and execute 8086 assembly Language Programs to multiply two 16 bit numbers.
3. Write and execute 8086 assembly Language Programs to divide 16 bit number by 8 bit number.
4. Write and execute 8086 assembly Language Programs to search a look-up table for a byte (make use of XLAT)
5. Write and execute 8086 assembly Language Programs to compare two strings (use String instructions)
6. Write and execute 8086 assembly Language Programs to arrange the data bytes in ascending/descending order.
7. Write and execute 8086 assembly Language Programs to generate Fibonacci series and store it from memory location 0050H.
8. Write and execute 8051 assembly language program to find smallest byte in a string of bytes.
9. Write and execute 8051 assembly language program to exchange two data strings.
10. Write and execute 8051 assembly language program to generate square wave of 1

KHz (and any other frequency) on one of the pin of output port.

11. Interface 8255 with 8086 microprocessor and write a program to glow the alternate LED's.
12. Interface 8255 with 8086 microprocessor and write a program to rotate the stepper motor.
13. Interface 8253 with 8086 microprocessor and write a program to generate square waveform.
14. Interface 8279 with 8086 microprocessor and write a 8086 instructions to initialize 8279 (for a task as per the user's requirement).
15. Interface of ADC using 8255 with 8086 and write a program to convert analog signal input into its equivalent digital value and store it in memory locations.

Note: Few programs should be based on MASM / Simulator. Minimum 4 interfacing experiments should be conducted.

B. E. Fifth Semester
(Electronics /Electronics & Communication/ Electronics &

Telecommunication Engg)

ANALOG CIRCUIT AND DESIGN

Duration: 3
Hrs. College Assessment: 20
Marks University Assessment:
80 Marks

Subject Code: BEENE503T/ BEECE503T/BEETE503T [4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study the basic characteristic, construction, open loop & close loop operations of Op-Amp.
2. To study linear and non linear applications of Op-Amp.
3. To study the design of Electronic Circuits for Oscillator, Multivibrator and Active Filters
4. To enable students to design regulated power supply using regulated ICs

Outcome:

After completing this course students shall be able to:

1. Describe basic differential Amplifier using transistor and its operation & characteristic.
2. Design linear Op-Amp circuits such as Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier circuits for various practical applications.
3. Design non-linear Op-Amp such as Comparators, Comparator IC such as LM 339, Schmitt trigger, multivibrator circuits for various practical applications using IC555.
4. Analyze and design amplifier circuits, oscillators, Filter, regulated power supply

Unit I:

OP-Amp Fundamentals:
(8)

Block diagram of OP-Amp (Basic Building Blocks), Basic differential Amplifier using transistor and its operation, OP-Amp parameters, characteristic and Definition, Ideal OP-Amp, Equivalent circuit, Voltage Transfer curve, Inverting and Non-inverting configurations and design, concepts of virtual short and ground.

Unit II:
OP-Amp Linear Applications:
(10)

Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators (Practical considerations and design),Peak detector, Log and antilog amplifiers using OP-Amp & Transistor and analog multipliers.

Unit III:

OP-Amp Non-Linear Applications: (12)

Comparators, Schmitt trigger, Comparator IC such as LM 339, Clipper and Clamper, Precision Rectifier, PLL Multivibrators: Bistable, Monostable, Astable multivibrator circuits using IC 555, Sample/Hold circuits, D/A (R/R) & A/D conversion circuits (Successive Approximation Method), design of ADC using 0804 ICs.

Unit IV:

Design of Power supply system: (09)

Unregulated D.C. power supply system with rectifiers and filters, Design of series voltage regulators, Design of regulators using IC 78×× and 79××, protection circuits for regulators, Design of SMPS (Buck & Boost)

Unit V:

Design of sinusoidal oscillators & Function generator: (09)

OPAMP based Wein Bridge and Phase Shift oscillators, Transistorized Hartley, Colpitts oscillator, and Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits. Design of function generators.

Unit VI:

Design of Filters & Drivers: (12)

Advantages of active filters, Design of Butterworth Active Filter, Design of Active filter of LPF, HPF, BPF of 1^{st} 2^{nd} order, and higher order (up to 6^{th} order) Butterworth filter

Design of Relay driver circuit, Design of stepper motor control circuit, Design of Dc servo motor control circuit

Books:

Text Books:

1. Operational Amplifier and Applications: R. Gayakwad.
2. Monograph on Electronic circuit Design: Goyal & Khetan.
3. Designing with Op-Amps: Franco (Mc Graw Hill).

Ref Books:

1. Linear Integrated Circuits Mannal I, II, and III: National Semiconductor.
2. Linear Applications Handbook National Semiconductors.
3. Regulated Power supply Handbook. Texas Instruments.
4. Electronics: BJT‘s, FETS and Microcircuits – Anielo.
5. Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.

B. E. Fifth Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

ANALOG CIRCUIT AND DESIGN

Duration: 2
Hrs. College Assessment: 25
Marks University Assessment:
25Marks

Subject Code: BEENE503P/ BEECE503P/BEETE503P **[0 – 2 – 0– 2]**

Objectives:

1. To learn about various types of analog systems.
2. To study the practical aspects of linear and non-linear applications of OP-AMP.
3. To design the oscillators using OP-AMP and Transistors.
4. To study frequency response of different circuits based on operational amplifier.

Outcome:

At the end of the course the students shall be able to:

1. Gain a sound understanding of the operation, analysis and design of analog electronic circuits and systems
2. Design linear and nonlinear applications of operational amplifier.
3. Design the oscillators and other complex circuits using op amp ICs.
4. Describe gain-bandwidth concept and frequency response of basic amplifiers.

Any TEN practicals are to be conducted

List of Experiments:

1. (A)Design Non-Inverting OP-AMP and measure the gain and plot the input/output waveforms. (B)Design Inverting OP-AMP and measure the gain and plot the input/output waveforms.
2. Plot the Frequency response of Inverting and Non-inverting amplifiers.
3. Implementation of Op-Amp as adder & subtractor.
4. To design OP-AMP as Integrator and Differentiator and plot its input/output waveforms.
5. To design OP-AMP as Schmitt trigger for generating a waveform of specific pulse width.
6. To design OP-AMP as peak detector.
7. To design OP-AMP as Precision rectifier and plot the waveforms.
8. To Verify Op-amp parameters (1) CMRR (2) Slew Rate.

9. To Verify and simulate Clipper circuit using IC 741.
10. Design and verify Multivibrator circuits using IC 555.
11. To study Phase Lock Loop using IC 565.
12. To study OP-AMP as Clippers & Clampers.
13. Design RC oscillator using OP-AMP and calculate its frequency.
14. Design transistorized LC oscillator and calculate its frequency.
15. Design first & second order low pass Butterworth filer.
16. Design first & second order high pass Butterworth filer.
17. Design of series voltage regulators.
18. Design of Driver Circuit for DC servomotor/Relays.
19. Design of control circuit for stepper motor.

Note: Simulate results using simulation software for at least four experiments.

B. E. Fifth Semester
(Electronics / Electronics & Communication / Electronics & Telecommunication Engg)

COMMUNICATION ELECTRONICS

Duration: 3 Hrs.
College Assessment: 20
Marks University Assessment: 80 Marks

Subject Code: BEENE504T/ BEECE504T/BEETE504T [4 – 0 – 1 – 5]

Objectives:

The course objectives are:

1. To study the basic concept of communication and different modulation system based on basic parameters.
2. To study the concept of noise, properties & its effects.
3. To study the AM, FM, PM process & compute modulation Index. 4. To study the fundamentals of AM and FM Receivers.
4. To develop knowledge about fundamentals of Broadband Communication Systems.

Outcome:

At the end of the course the students shall be able to:

1. Demonstrate a basic understanding of the term bandwidth and its application in communications. 2. Describe quantizing and PCM signals, bandwidth and bit rate calculations, study amplitude and
2. angle modulation and demodulation of analog signals etc.
3. Solve the problems involving bandwidth calculation, representation & Generation of an AM sine wave
4. Compare different modulation techniques of Generation of FM (Direct & Indirect Method) 5. Identify, formulate & solve communication engineering problems.

Unit I: Amplitude (Linear) Modulation (08)

Base band & Carrier communication, Introduction of amplitude modulation, Equation of AM, Generation of AM (DSBFC) and its spectrum, Modulation Index , Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, Non linear generation, switching modulator, Ring modulator & its spectrum, SSBSC, ISB & VSB, their generation methods & Comparison, AM Broadcast technical standards.

Unit II: Angle Modulation (12)

Concept of Angle modulation, Types of Angle Modulation, frequency spectrum, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function and its mathematical analysis, Generation of FM (Direct & Indirect Method), Comparison of FM and PM.

Unit III: Pulse Modulation (10)

Band limited & time limited signals, Narrowband signals and systems, Sampling theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. Pulse Analog modulation: PAM PWM & PPM.

PCM – Generation & reconstruction, Bandwidth requirement of PCM.Differential PCM, Delta Modulation & Adaptive DM. (Only Block diagram treatment).

Unit IV: Noise **(10)**

Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem Connection, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth.

Unit V: AM and FM Receivers **(10)**
Communication Receiver, Block Diagram & special Features

Block diagram of AM and FM Receivers, Super heterodyne Receiver, Performance characteristics:
Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, Pre-emphasis, De-emphasis

AM Detection: Rectifier detection, Envelope detection, Demodulationof DSBSC: Synchronous detection, Demodulation of SSBSC.

FM Detection: Foster Seelay FM Detector & FM detection using PLL

Unit VI: Broadband Communication Links & Multiplexing: **(10)**

Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing.

Short and Medium Haul Systems: Coaxial Cables, Fiber optic links, Microwave Links, Tropospheric scatter Links.

Long Haul Systems: Submarine .

Books:

Text Books:

1. Kennedy & Devis : Electronic Communication Systems , Tata McGraw Hills Publication(Fourth Edition)
2. Dennis Roddy & Coolen - Electronic Communication, Pearson Education (Fourth Edition)
3. B. P. Lathi: Modern Digital and Analog. Communication Systems: Oxford Press Publication (Third Edition)

Reference Books:

1. Simon Haykin: Communication Systems, John Wiley & Sons (Fourth Edition)
2. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill
3. Leon W.Couch, II: Digital and Analog Communication Systems, Pearson Education (Seventh Edition)
4. Electronic Communication Systems, Roy Blake, CENGAGE Learning.

B. E. Fifth Semester

(Electronics / Electronics & Communication / Electronics & Telecommunication Engg)

COMMUNICATION ELECTRONICS

Duration: 2 Hrs.
College Assessment: 25
Marks University Assessment:
25 Marks

Subject Code: BEENE504P/ BEECE504P/BEETE504P [0 – 2 – 0 – 2]

Objectives:

1. To perform practical based on analog and digital modulation techniques.
2. z . To study the analysis of AM and FM receivers.
3. To study ASK, FSK and PSK techniques.
4. To perform Matlab based practical for different modulation techniques.

Outcome:

At the end of the course the students shall be able to:

1. Demonstrate different modulation techniques used in electronic communication system.
2. Use the modulation techniques and modern communication tools necessary for various engineering applications.
3. Evaluate fundamental communication system parameters, such as bandwidth power, signal to quantization noise ratio, data rate etc.

Any TEN practicals are to be conducted

List of Practicals

1. To generate Amplitude Modulated wave using different techniques and plot its waveform.
2. To study different AM detection techniques.
3. To measure Noise Figure.
4. To generate Frequency Modulated wave using different techniques and plot its waveform.
5. To study different FM Detection Techniques.
6. To generate Pulse Amplitude Modulation (PAM) and plot the waveforms. Observe the demodulated output.
7. To generate Pulse Width modulated signal and study PWM demodulation.
8. To generate Pulse Position modulated signal and study Pulse Position Demodulation.
9. To study Single side band (SSB) Transmission & Reception
10. To study Double Side Band (DSB) Transmission & Reception
11. To study generation of SSB-SC using balanced modulator
12. To study generation of DSB-SC signal.
13. To study DTMF Encoder Decoder
14. To perform Spectrum Analysis of AM & FM signals
15. To perform Time Division Multiplexing (TDM).

16. To study Pre-Emphasis and De-Emphasis
17. To study Super heterodyne Receiver
18. To study FM radio receiver circuit.
19. Simulation of Analog modulation techniques using MATLAB.
20. Simulation of Frequency modulation techniques using MATLAB.
21. To perform Pulse Code Modulation (PCM) using Simulation in MATLAB.