B.Tech. Electronics and Communications Engineering (ECE)

KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme of exams w.e.f. session 2025-26

SEMESTER-III

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						End Semester Exam	Internal assessment	Practical Exam	Total	
1	B24-ESC-201	Integral Transforms & Numerical Techniques	3:1:0	4	4	70	30	--	100	3
2	B24-ECE-201	Electronic Devices	3:0:0	3	3	70	30	--	100	3
3	B24-ECE-203	Digital Electronics	3:0:0	3	3	70	30	--	100	3
4	B24-ECE-205	Signals and Systems	3:0:0	3	3	70	30	--	100	3
5	B24-ECE-207	Network Theory	3:0:0	3	3	70	30	--	100	3
6	B24-ECE-209	Analog Communication	2:1:0	3	3	70	30	--	100	3
7	B24-ECE-211	Electronic Devices Lab	0:0:3	3	1.5	--	40	60	100	3
8	B24-ECE-213	Digital Electronics Lab	0:0:3	3	1.5	--	40	60	100	3
9	B24-ECE-215	Signals and Systems Lab	0:0:2	2	1	--	40	60	100	3
10	B24-MAC-201	Environmental Studies	3:0:0	3	1	70	30	--	100	3
TOTAL				**30**	**24**	**490**	**330**	**180**	**1000**	

- **NCC/NSS/Sports/Yoga/Technical or cultural club/society activities may also be joined by students in second year and will be evaluated in 7th semester by the institute based upon continuous evaluation model as per guidelines.**

B24-ESC-201	**INTEGRAL TRANSFORMS & NUMERICAL TECHNIQUES**						
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**1**	**-**	**4**	**70**	**30**	**100**	**3 h**
Purpose	To familiarize the prospective students with Laplace Transform to solve the differential equations and uses of numerical techniques to find out the approximate solutions.						

Course Outcomes	
CO1	Introduction about the concept of Laplace transform and how it is useful in solving the definite integrals and initial value problems.
CO 2	To introduce the tools of numerical methods for the solutions of system of linear equations.
CO 3	How polynomial and transcendental equations can be solved for approximated solution whose exact solution otherwise cannot be evaluated.
CO4	To familiar with essential tool of Numerical Integration needed to approximate solutions for the ordinary differential equations.

UNIT-I (12 Hrs)

Laplace Transform: Introduction, Laplace Transform of Elementary Functions, Basic properties of Laplace Transform, Laplace transform of periodic functions, finding inverse Laplace transform by different methods, Convolution theorem, solving ordinary differential equations by Laplace Transform method.

UNIT-II (07 Hrs)

Solution of system of Linear equations using Gauss Elimination and Gauss Seidel methods, row echelon form, LU factorization, Cholesky method.

UNIT-III (11 hrs)

Solution of polynomial and transcendental equations: Newton-Raphson method and Regula Falsi method, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

UNIT-IV (10 hrs)

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules, Ordinary differential equations: Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations, predictor-corrector method.

Suggested Books:

1. 1. S. D. Conte and Carl de Boor, Elementary Numerical Analysis- An Algorithmic Approach (3rd Edition), McGraw-Hill, 1980.
2. C. E. Froberg, Introduction to Numerical Analysis (2nd Edition), Addison-Wesley, 1981.
3. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley (1999).
4. Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing (2022).
5. K. E. Atkinson, An Introduction to Numerical Analysis (2nd edition), Wiley-India, 1989
6. R. Agor, Elements of Mathematical Analysis, Khanna Publishing House, 2015.
7. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
9.Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Note: The paper setter will set the paper as per the question paper templates provided.

B24-ECE-201	**Electronic Devices**						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Total	Time
3	---	__	3	70	30	100	3 Hrs
Purpose	To familiarize the students with the concepts of semiconductors and their current transport phenomenon, basic electronic devices with their working and characteristics and different voltage regulators.						
Course Outcomes (CO)							
CO1	Understand the principles of semiconductor Physics and apply it to electronic devices						
CO2	Appreciate different devices for different applications.						
CO3	Understand and utilize the different electronic devices along with their applications.						
CO4	To Understand voltage regulation and different voltage regulators						

Unit 1

Introduction to Semiconductor Physics: Energy bands in intrinsic and extrinsic silicon; Fermi Level, Fermi Level in Intrinsic and Extrinsic Semiconductor, Carrier transport: diffusion current, drift current, mobility and resistivity, Generation and recombination of carriers; continuity equation.

Unit 2

P-N junction diode: Working of diode, Potential barrier, diode equation, I-V characteristics, and small signal switching models

P-N diode clipping circuits, Avalanche breakdown, Zener diode, Schottky diode its working and characteristics, Photodiode.

Unit 3

Bipolar Junction Transistor: Unbiased transistor, Biasing, Operation of a transistor, Configurations of a transistor, Different modes of BJT.

Field Effect Transistor: Types of FET, Working of FET, I-V characteristics, and small signal models of FET, Parameters of FET, MOS capacitor.

Unit 4

Voltage Regulation, DC regulated power supply, Zener diode shunt voltage regulator, Transistor series and shunt voltage regulator, Improved transistor voltage regulator.

Text /Reference Books

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices”, 7th edition, Pearson, 2014.
2. S. M. Sze and K. N.K wok “Physics of Semiconductor Devices”3rd edition, John Wiley &Sons

UNIT-I

B24-ECE-203	**Digital Electronics**						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Total	Time
3	-	-	3	70	30	100	3 Hrs.
Course Outcomes (CO)							
CO1	Students will be able to understand the basic logic gates and will be able toapply minimization techniques for reducing a function upto six variables.						
CO2	Students will be able to design combinational circuits and applications relatedto them.						
CO3	Students will be able to write the truth table, excitation table, characteristic equations of various flip flops and to design the sequential circuits using Flipflops.						
CO4	Students will be able to familiarize with varied memory types and various A/D, D/A Converters and their characteristics.						

Fundamentals of Digital Systems and Techniques: Digital signals, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, number systems: binary, signed binary, octal, hexadecimal number, binary arithmetic, one's and two's complements arithmetic, Codes :BCD codes, Excess-3, Gray codes, Error detecting and correcting codes: parity check codes and Hamming code

Minimization Techniques : Basic postulates and fundamental theorems of Boolean algebra: Standard representation of logic functions: SOP and POS forms, Simplification of switching functions using K-map and Quine-McCluskey tabular methods, Don't care conditions, Digital logic families: TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri- statelogic.

UNIT-II

Combinational Digital Circuits: Design procedure: Half adder, Full Adder, Half subtractor, Full subtractor , Parallel binary adder, parallel binary Subtractor, Carry Look Ahead adder, Serial Adder/Subtractor, BCD adder, Binary Multiplier, Binary Divider, Multiplexer/ De-multiplexer, decoder, encoder, parity checker, parity generators, code converters, Magnitude Comparator.

UNIT-III

Sequential circuits: A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K, T and D types flip flops, applications of flip flops: shift registers, serial to parallel converter, parallel to serial converter, Synchronous and Asynchronous mod counter ,FSM, sequence generator and detector.

UNIT-IV

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R LadderD/A converter, specifications for D/A converters, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, specifications for A/D converters **Semiconductor Memories and Programmable Logic Devices**: Characteristics of memories, read onlymemory (ROM), read and write memory (RAM), Programmable logic array, Programmable array logic, Introduction to Field Programmable Gate Array (FPGA)

Text Books:

1. M. M. Mano, "Digital design", Pearson Education India, 2016.
2. Donald P. Leach and Albert Paul Malvino, Digital Principles and Applications, 8th Edition, TMH, 2003.
3. Taub Schilling, Digital Integrated Electronics, TMH

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. A.K. Maini, Digital Electronics, Wiley India
3. R P Jain, Modern digital electronics, TMH.

B24-ECE-205	Signals and Systems						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**-**	**-**	**3**	**70**	**30**	**100**	**3 Hrs.**
Course Outcomes (CO) At the end of this course, students will demonstrate the ability to							
CO1	Analyze different types of signals.						
CO2	Represent continuous and discrete systems in time and frequency domain using different transforms.						
CO3	Understand sampling theorem and its implications.						

UNIT-I

Introduction to Signals: Continuous and discrete time signals, deterministic and stochastic signals, periodic and a periodic signals, even and odd signals, energy and power signals, exponential and sinusoidal signals and singular functions. Signal representation in terms of singular functions, orthogonal functions and their use in signal representation

Introduction to Systems: Linear and non-linear systems, time invariant and time varying systems, lumped and distributed systems, deterministic and stochastic systems, casual and non-causal systems, analog and discrete/digital memory and memory less systems.

UNIT-II

Random Variables: Introduction to Random Variables, pdf, cdf, moments, distributions, correlation functions.

Linear Time Invariant Systems: Introduction to linear time invariant (LTI) systems, properties of LTI systems, convolution integral, convolution sum, causal LTI systems described by differential and difference equations, Concept of impulse response.

UNIT-III

Discretization of Analog Signals: Introduction to sampling, sampling theorem and its proof, effect of undersampling, reconstruction of a signal from sampled signal.
Fourier Series : Continuous time Fourier series (CTFS), Properties of CTFS, Convergence of fourier series, Discrete time Fourier Series (DTFS), Properties of DTFS **,** Fourier series and LTI system, Filtering.

UNIT-IV

Fourier Transform: Continuous Time Fourier Transform (CTFT), Properties of CTFT, Systems characterized by linear constant- coefficient differential equations, Discrete time fourier transform (DTFT), Properties of DTFT, Duality, Systems characterized by Linear constant coefficient difference equations.

Laplace Transform: Introduction to Laplace transform, Region of convergence for Laplace transform, Inverse laplace transform, Properties of laplace transform, Analysis and characterization of LTI systems using laplace transform, System function algebra and block diagram representations, Unilateral laplace transform.

Text Books:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems, Prentice Hall

India, 2nd Edition, 2009
Reference Books:
1. Simon Haykins – "Signal & Systems", Wiley Eastern
2. Tarun Kumar Rawat , Signals and Systems , Oxford University Press.
3. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
4. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
5. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

Note: Question paper template will be provided to the paper setter.

B24-ECE-207	Network Theory						
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**0**	**-**	**3**	**70**	**30**	**100**	**3 Hr.**
Course Outcomes							
CO1	Understand basics electrical circuits with nodal and mesh analysis.						
CO2	Appreciate electrical network theorems.						
CO3	Apply Laplace Transform for steady state and transient analysis.						
CO4	Determine different network functions and appreciate the frequency domain techniques.						

UNIT I

Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC circuits.

UNIT 2

Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

UNIT 3

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

UNIT 4

Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Text/Reference Books

1. Van, Valkenburg.; "Network analysis"; Prentice Hall of India
2. F. F. Kuo , "Network Analysis & Synthesis", John Wiley & Sons Inc
3. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education
4. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi,1994
5. A William Hayt, "Engineering Circuit Analysis", McGraw-Hill Education
6. Ashfaq Husain, Networks and Systems, Khanna Book Publishing, 2021.

B24-ECE-209	Analog Communication						
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
2	**1**	**-**	**3**	**70**	**30**	**100**	**3 Hr.**
Course Outcomes							
CO1	Describe different types of noise and predict its effect on various analog communication systems and Understand the concepts of Analog Modulations in time and frequency domain.						
CO2	Understand and analyze various AM Transmitters & Receivers Methods and their circuits.						
CO3	Understand and analyze various FM Transmitters & Receivers Methods and their circuits.						
CO4	Understand and analyze various SSB Transmitters & Receivers Methods and Understand the concepts of Pulse Modulation and Demodulation circuits.						

Unit-I

Communication system and Noise: Constituents of communication system, Modulation, Bandwidth requirement, Noise, Classification of noise, Resistor noise, Multiple resistor noise sources, Noise Temperature, Noise bandwidth, Noise figure, its calculation and measurement, Bandpass noise representation, Noise calculation in Communication Systems, Noise in Amplitude Modulated System, Noise in angle modulated systems.

Analog Modulation Techniques: Theory of amplitude modulation, AM power calculations, AM modulation with a complex wave, Concepts of angle modulation, Theory of frequency modulation, Mathematical analysis of FM, Spectra of FM signals, Narrow band FM, Wide band FM, Phase modulation, Phase modulation obtained from frequency modulation, Comparison of AM, FM & PM.

Unit-II

AM Transmission: Generation of Amplitude Modulation, Low level and high level modulation, Basic principle of AM generation, Square law modulation, Vander bijl modulation, Suppressed carrier AM generation (Balanced Modulator) ring Modulator.

AM Reception: Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver, RF Amplifier, Image Frequency Rejection, Cascade RF Amplifier, Frequency Conversion and Mixers, Tracking & and Alignment, IF Amplifier, AM detector, Distortion in diode detectors, AM receiver characteristics.

Unit-III

FM Transmission: FM allocation standards, Generation of FM by direct method, Varactor diode Modulator, Indirect generation of FM, The Armstrong method RC phase shift method, Frequency stabilized reactance FM transmitter, FM stereo transmitter, Noise triangle.

FM Reception: Direct methods of Frequency demodulation, Frequency discrimination (Balanced slope detector), Foster seelay detector, phase discriminator, Ratio detector, Indirect method of FM demodulation, FM detector using PLL, Pre-emphasis / de-emphasis, The FM receiver, FM stereo receiver.

Unit-IV

SSB Transmission: Introduction, Advantages of SSB Transmission, Generation of SSB, The Filter method The Phase Shift Method, The Third Method, Pilot Carrier SSB, Vestigial Side-band Modulation (VSB), VSB-SC, Application of AM and FM in TV transmission.

SSB Reception: SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Pilot Carrier SSB Receiver, SSB Double Super-hetrodyne Receiver, Modern Communication Receiver.

Analog Pulse Modulation: Introduction, Pulse amplitude modulation (PAM), PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM): Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), PPM Demodulator,

Text Books

1. Kennedy, G., Electronic Communication Systems, McGraw-Hill (2008) 4th ed.
2. Lathi.B.P.,Modern Digital and Analog Communications Systems 3rd ed.

Reference Books

1. Taub, H., Principles of Communication Systems, McGraw-Hill (2008) 3rd ed.
2. Haykin, S., Communication Systems, John Willey (2009) 4th ed.
3. Proakis, J. G. and Salehi, M., Fundamentals of Communication Systems, Dorling Kindersley (2008) 2nd ed.
3. Mithal G K, Radio Engineering, Khanna Pub.
4. Singh & Sapre—Communication Systems: 2/e, TMH

Note: Separate paper template will be provided to the paper setter for setting the question paper of end term semester examinations.

B24-ECE-211	**Electronic Devices Lab**						
Lecture	Tutorial	Practical	Credit	Practical Exam	Internal Assessment	Total	Time
_____	---	3	1.5	60	40	100	3 Hrs
Purpose	To impart the practical knowledge of basic electronic devices and their applications						
Course Outcomes (CO)							
CO1	To teach the students how to experimentally plot the VI characteristics of various diodes such as p-n diode, zener diode etc. find the threshold voltage and zener breakdown voltage from the VI curve.						
CO2	To experimentally analyze different type of rectifiers and calculation of ripple factors.						
CO3	To experimentally teach the students the concept of different configurations of regulated power supplies using Zener diode.						
CO4	To teach the students how to experimentally find the values of various parameters of Transistor such as voltage gain, current gain etc.						

List of Experiments:

1 To study the VI characteristics of p-n diode in forward and reverse bias and find the threshold voltage from the VI curve.
2 To study the operation of Zener diode as a voltage regulator.
3 To study the operation of half-wave and full wave rectifiers and calculate their ripple factor values.
4 To study the operation of series and parallel Clippers using P-N junction diodes.
5 To study the operation of clampers using P-N junction diodes.
6 To experimentally plot the input and output characteristics of a given BJT transistor in CE configuration and calculate its various parameters.
7 To experimentally plot the input and output characteristics of a given BJT transistor in CB configuration and calculate its various parameters.
8 To study the transfer and drain characteristics of JFET and calculate its various parameters.
9 To study the transfer and drain characteristics of MOSFET and calculate its various parameters.
10 To study the different types of negative feedback in two stage amplifier and to observe its effects upon the amplifier parameters.
11 To study the Zener diode as a transistor series voltage regulator.
12 To study the Zener diode as a transistor shunt voltage regulator.

Reference Books:

1. Millman & Halkias: Integrated Electronics, TMH.

2. Boylestad & Nashelsky: Electronic Devices & Circuit Theory, PHI.

Note: At least eight (8) experiments from the above list are mandatory to perform for the students.

B24-ECE-213	**Digital Electronics Lab**						
Lecture	Tutorial	Practical	Credit	Practical Exam	Internal Assessment	Total	Time
-	-	3	1.5	60	40	100	3 Hrs.
Course Outcomes (CO)							
CO1	Students will be able to verify truth tables of basic logic gates and designvarious gates using universal gates.						
CO2	Students will be able to design various combinational circuits and verify theiroperation.						
CO3	Students will be able to design different sequential circuits by using flip flopsand verify their operation.						
CO4	Students will be to study and design various encoders and decoders.						

List of experiments:

1. Familiarization with Digital Trainer Kit and associated equipment.

2. Study of TTL gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.

3. Design and realize a given function using K-Maps and verify its performance.

4. To verify the operation of Multiplexer and De-multiplexer.

5. To verify the operation of Comparator.

6. To verify the truth table of S-R, J-K, T, D Flip-flops.

7. To verify the operation of Bi-directional shift register.

8. To design and verify the operation of 3-bit asynchronous counter.

9. To design and verify the operation of asynchronous Up/down counter.

10. To design and verify the operation of asynchronous Decade counter.

11. Study of Encoder and Decoder.

12. Study of BCD to 7 segment Decoder

Text Books:

1. M. M. Mano, "Digital design", Pearson Education India, 2016.
2. Donald P. Leach and Albert Paul Malvino, Digital Principles and Applications, 8thEdition, TMH, 2003.

Note: *At least ten (10) experiments from the above list are mandatory to perform for the students.*

B24- ECE-215	Signals and Systems Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical Exam**	**Internal Assessment**	**Total**	**Time**
-	**-**	**2**	**1**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	To understand the basic concepts of software.						
CO2	To explore properties of various types of signals and systems.						
CO3	To explore different properties of signals and systems.						
CO4	To understand the concept of sampling in time and frequency domain.						

List of experiments:

1. Introduction of the software.
2. To demonstrate some simple signal.
3. To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting).
4. To visualize the complex exponential signal and real sinusoids.
5. To identify a given system as linear or non-linear.
6. To explore the time variance and time invariance property of a given system.
7. To explore causality and non-causality property of a system.
8. To determine Fourier transform of a signal.
9. To determine Laplace transform of a signal.
10. To demonstrate the time domain sampling of bandlimited signals (Nyquist theorem).
11. To demonstrate the sampling in frequency domain (Discrete Fourier Transform).
12. To demonstrate the convolution and correlation of two continuous-time signals.
13. To demonstrate the convolution and correlation of two discrete-time signals.

Reference Books:

1. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

2. Tarun Kumar Rawat , Signals and Systems , Oxford University Press.

Note: At least ten (10) experiments from the above list are mandatory to perform for the students.

B24-MAC-201	ENVIRONMENTAL STUDIES						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**-**	**-**	**1**	**70**	**30**	**100**	**3 Hrs.**
Purpose	**To learn the multidisciplinary nature, scope and importance of Environmental sciences.**						
Course Outcomes							
CO1	Students will be able to understand the importance of natural resources.						
CO2	Students will understand the concept of an ecosystem, its structure, and its functions.						
CO3	The students will be able to understand the causes and impacts of various environmental pollution.						
CO4	Students will be able to understand the relationship between human population and the environment.						

UNIT-I

Introduction to Environmental studies: The Multidisciplinary nature of environmental studies Definition; Scope and importance, Need for public awareness.

Natural Resources: Forest resources: Use and Over-exploitation, deforestation. Timber extraction, mining, dams, and their effects, Water resources: Use and over-utilization of surface and groundwater, conflicts over water, dams benefits and problems, Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Energy resources: renewable and non-renewable energy sources, Land resources: land degradation, soil erosion, and desertification.

UNIT-II

Ecosystems: Concept of an ecosystem, Structure, and function of an ecosystem, Energy flow in the ecosystem, Ecological succession, Food chains, food webs, and ecological pyramids. Major types of ecosystem-Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem.

Biodiversity and its Conservation: Introduction-Definition: genetic, species, and ecosystem diversity. Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III

Environmental pollution: Causes, effects, and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Nuclear hazards, and Solid waste Management: Causes, effects, and control measures of urban and industrial wastes, Disaster management: floods, earthquake, cyclone and landslides.

Social Issues and the Environment: Sustainable development, Water conservation, rainwater harvesting, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible

solutions, Climate change, global warming, acid rain, ozone layer depletion, and wasteland reclamation. Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act., and Forest Conservation Act.

UNIT-IV

Human population and the Environment: Population growth, Population Explosion-Family welfare Programme, Environment and human health. Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Drugs and their effects; Useful and harmful drugs; Use and abuse of drugs; Stimulant and depressant drugs. Concept of drug de-addiction. Legal position on drugs and laws related to drugs.

Field Work (Practical)-

- Visit to a local area to document environmental assets -river/forest/grassland/ hill/mountain.
- Visit to a local polluted site- Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, and birds.
- Study of simple ecosystems- pond, river, hill slopes, etc.

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Kaushik, Anubha and Kaushik, C.P. (2004 Perspectives in Environmental Studies, New age International Publishers.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad -380013, India, Email: mapin@icenet. net (R).
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
5. Clerk B.S., Marine Pollution, Clanderson Pross Oxford (TB).
6. Cunningham, W.P.Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment (R).

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

B.Tech. Electronics and Communications Engineering (ECE)

KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme of exams w.e.f. session 2025-26

SEMESTER-IV

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						End Semester Exam	Internal assessment	Practical Exam	Total	
1	B24-HSM-202	Innovation, Startups and Entrepreneurship	3:0:0	3	3	70	30	--	100	3
2	B24-ECE-202	Advanced Microprocessors and Interfacing	3:0:0	3	3	70	30	--	100	3
3	B24-ECE-204	Analog Circuits	3:0:0	3	3	70	30	--	100	3
4	B24-ECE-206	Electromagnetic Waves	3:0:0	3	3	70	30	--	100	3
5	B24-ECE-208	Verilog HDL	3:0:0	3	3	70	30	--	100	3
6	B24-ECE-210	Analog Circuits Lab	0:0:3	3	1.5	--	40	60	100	3
7	B24-ECE-212	Electromagnetic Waves Lab	0:0:3	3	1.5	--	40	60	100	3
8	B24-ECE-214	Microprocessor & Interfacing Lab	0:0:3	3	1.5	--	40	60	100	3
9	B24-ECE-216	Electronic Design Workshop	0:0:3	3	1.5	--	40	60	100	3
10	B24-ECE-218	Verilog HDL Lab	0:0:2	2	1	--	40	60	100	3
11	B24-MAC-202	Essence of Indian Traditional Knowledge	2:0:0	2	1	--	100	--	100	3
TOTAL				31	24	350	450	300	1100	

Note: All students have to undertake the industrial training for 6 to 8 weeks after 4th semester which will evaluated in 5th semester.

B24-HSM-202		**Innovation, Startups and Entrepreneurship**					
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**-**	**-**	**3**	**70**	**30**	**100**	**3** Hours

Course Outcomes	
Purpose	***The objective of this Course is to inspire students and help them imbibe entrepreneurial mindset.***
CO 1	*Understanding the essence of innovation and features of innovative processes; models and methods of innovative entrepreneurship, the role of innovation as a major factor in creating the value of companies*
CO 2	*Understanding, the dynamic role of entrepreneurship and small businesses, , types of business structure, organizing and managing a Small Business*
CO 3	*Understanding concept of start ups, Control Strategic Marketing Planning , concept of incubation and proto type, new Product Development, Business Plan Creation.*
CO 4	*Understanding risk analysis in business, financing methods, role of government in supporting entrepreneurship*

Unit -I

Introduction to Innovation and Entrepreneurial Idea Generation and Identifying Business Opportunities, Management Skills for Entrepreneurs, Innovations and their forms, Innovation - features and characteristics, Factors initiating innovations, Innovation process and its stages, Statistical measurement of innovation, Model of innovation, Source of innovation, Technological transfer, Information technology to support innovation, difference between technological and non-technological innovation

Unit-II

Introduction to Entrepreneurship and Start – Ups - Definitions, Traits of an entrepreneur, Intrapreneurship, Entrepreneurial Motivation ,Functions of Entrepreneur, Concept, Growth of Entrepreneurship in India, Types of Business Structures, Similarities /differences between entrepreneurs and managers, Business Ideas and their implementation, Discovering ideas and visualizing the business, Activity map, Types of startups, role of entrepreneurs in economic development, future of entrepreneurs, entrepreneurial process

Unit -III

Start ups - Initial idea generation and planning stages, and incubation referring to the development process of identifying and developing new ideas for products, services, or processes, and creating a working model or prototype to test the feasibility of the concept.

Market Analysis – Identifying the target market, Competition evaluation and Strategy Development, Five Cs of Opportunity Identification, Market Opportunity Identification in emerging technology companies, Process of creating and growing a new business venture, Business plan of the innovation project.

Unit -IV

Risk Analysis: Risk management in venture projects, Financing and Protection of Ideas- Financing methods available for start-ups in India, Communication of Ideas to potential investors – Investor Pitch, Patenting and Licenses, Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy, venture capital, angel investment, and crowdfunding.

Government support- programs and initiatives aimed at supporting the development of new ideas, innovations, and startups, funding and mentorship, IPR - legal protection of a person's or organization's rights to their invention, brand, or creative work

Suggested Readings:

- Shrutin N Shetty, (2018), Design the Future: Simplifying Design Thinking to Help You, Notion Press
- "Entrepreneurship development small business enterprises", Pearson, Poornima M Charantimath,2013.
- Roy Rajiv, "Entrepreneurship", Oxford University Press, 2011.
- "Innovation and Entrepreneurship",Harper business- Drucker.F, Peter, 2006.
- "Entrepreneurship", Tata Mc-graw Hill Publishing Co.ltd new Delhi- Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, 8th Edition, 2012
- The Three-Box Solution: A Strategy for Leading Innovation By Vijay Govindarajan
- Boutellier, Roman; Gassmann, Oliver; von Zedtwitz, Maximilian (2000). Managing Global Innovation. Berlin: Springer.. ISBN 3-540-66832-2.
- Brown K. and Stephen P. Osborne (2005) Managing change and innovation in public service organisation. New York: Routledge
- Cappellin R. and Wink R. (2009) International Knowledge and Innovation Networks Knowledge Creation and Innovation in Medium-technology Clusters. UK: Edward Elgar Publishing Limited.
- Eveleens, C. (2010). Innovation management; a literature review of innovation process models and their implications. Working Paper HAN University of Applied Sciences.
- Enterpreneurship Development- S.Chand & Co.,Delhi- S.S.Khanka 1999
- Small-Scale Industries and Entrepreneurship. Himalaya Publishing House, Delhi –Vasant Desai 2003.
- Entrepreneurship Management -Cynthia, Kaulgud, Aruna, Vikas Publishing House, Delhi, 2003.
- Entrepreneurship Ideas in Action- L. Greene, Thomson Asia Pvt. Ltd., Singapore, 2007

B24-ECE-202	**Advanced Microprocessors and Interfacing**						
Lecture	Tutorial	Practical	Credit	Internal Assessment	End Semester Exam	Total	Time
3	-	-	3	70	30	100	3 Hrs.
Course Outcomes (CO) Upon completion of the course, students will be able to							
CO1	To learn the architecture 8086 Microprocessor.						
CO2	To learn the instruction set of 8086 Microprocessor and assembly language programming of 8086 Microprocessor.						
CO3	To learn about interfacing of 8086 with different types of Memories						
CO4	To learn about interfacing of interrupts, basic I/O and DMA with 8086 Microprocessor.						

Unit – I

8086 CPU ARCHITECTURE: 8086 Block diagram; description of data registers, address registers; pointer and index registers, PSW, Queue, BIU and EU. 8086 Pin diagram descriptions. Generating 8086 CLK and reset signals using 8284. WAIT state generation. Microprocessor BUS types and buffering techniques, 8086 minimum mode and maximum mode CPU module.

UNIT-II

8086 INSTRUCTION SET: Instruction formats, addressing modes, Data transfer instructions, string instructions, logical instructions, arithmetic instructions, transfer of control instructions; process control instructions; Assembler directives.

8086 PROGRAMMING TECHNIQUES: Writing assembly Language programs for logical processing, arithmetic processing, timing delays; loops, data conversions.

UNIT-III

MAIN MEMORY SYSTEM DESIGN: Memory devices, 8086 CPU Read/Write timing diagrams in minimum mode and maximum mode. Address decoding techniques. Interfacing SRAMS; ROMS/PROMS. Interfacing and refreshing DRAMS.

UNIT-IV

BASIC I/O INTERFACE: Parallel and Serial I/O Port design and address decoding. Memory mapped I/O Vs Isolated I/O Intel's 8255 and 8251- description and interfacing with 8086. ADCs and DACs, - types, operation and interfacing with 8086. Interfacing Keyboards, multiplexed displays, and stepper motor with 8086.

INTERRRUPTS AND DMA: 8086 Interrupt mechanism; interrupt types and interrupt vector table. Applications of interrupts, Intel's 8259. DMA operation. Intel's 8247.

Text Books:

1. Barry B. Brey, "The Intel Microprocessor8086/8088, 80186", Pearson Education, Eighth Edition, 2009
2. D.V. Hall, Microprocessors and Interfacing, McGraw Hill 3nd ed.
3. Liu, Gibson, "Microcomputer Systems: The 8086/88 Family", 2nd Edition, PHI.
4. Kenneth Ayala, "The 8086 Microprocessor: Programming & Interfacing the PC", Cengage Learning, Indian Edition, 2008.

Reference Books:

1. Kip Irvine, "Assembly language for IBM PC", PHI, 2nd Edition, 1993
2. Uffenback, "The 8086 Family Design" PHI, 2nd Edition.
3. Walter A Triebel and Avtar Singh; The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware and Applications, Fourth Edition, Pearson Education.

B24-ECE-204	**Analog Circuits**						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	Total	Time
3	---	__	3	70	30	100	3 Hrs
Purpose	To familiarize the students with the concepts of different analog circuits, their detailed analysis, different oscillators and operational amplifier.						
Course Outcomes (CO)							
CO1	To make the students understand the analysis of various BJT and FET amplifiers using small signal models.						
CO2	To teach the students the concept of describe the frequency response of multistage amplifiers and the detailed concept of feedback topologies.						
CO3	To make the students learn various oscillator circuits using both Op-Amp and BJT.						
CO4	To teach the students the various application circuits of Op-Amp and designing for a given specification.						

Unit 1

Amplifier Models: Amplifier types: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Small signal analysis of BJT amplifiers: CE, CB and CC amplifiers using re model, small signal analysis of the CS JFET amplifiers, estimation of voltage gain, input resistance, output resistance etc.

Unit 2

Transistor Frequency Response: Class A, class B, class C amplifiers: calculation of maximum efficiency. Frequency response of the amplifiers: low frequency, mid-frequency and high frequency region. Effect of cascading of amplifiers on the frequency response, cut-off frequencies, Bandwidth and voltage gain. Miller effect, Feedback in amplifiers: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth, input impedance, output impedance.

Unit 3

Oscillators: Barkhausen criterion for oscillators, types of Oscillators: RC phase shift oscillator, Wien bridge oscillator, LC oscillators : Hartley oscillator, Collpit oscillator, derivation of frequency of oscillation. 555 timer: operation as astable and monostable multivibrator.

Unit 4

Op-Amp Applications: Simple op-amp circuits: adder, subtractor, Schmitt trigger, Differential amplifier: calculation of differential gain, common mode gain, CMRR, OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages.

Text /Reference Books

1. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi, 1995.
2. E S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.
3. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.
4. S Salivahanan and N Naresh Kumar, Electronics devices and circuits, McGraw Hill,1998.

B24-ECE-206	**Electromagnetic Waves**						
Lecture	Tutorial	Practical	Credit	End Semester exam	Internal Assessment	Total	Time
3	0	0	3	70	30	100	3 Hrs.
Objective	*To familiarize the students with the concepts of Electric field, Magnetic Field and relation between them so that students can develop understanding about the generation and propagation of electromagnetic waves.*						
CO1	*Students will be able to understand and apply the basic laws of Electrostatics for the generation and propagation of electric field in different media.*						
CO2	*Students will be able to understand and apply the basic laws of Magnetostatics for the generation and propagation of magnetic field in different media.*						
CO3	*Students will be able to understand and develop the relations between Electric field and Magnetic field.*						
CO4	*Students will be able to understand and analyze the propagation of wave in different media.*						

Unit-I

ELECTROSTATICS: Review of coordinate system and vectors: Cartesian, Cylindrical and Spherical coordinate systems. Review of vectors: Gradient, curl, and Divergence of vector. Review of integral calculus: Line integral, Surface integral and Volume integral. Coulomb's law. Electric Field Intensity, Electric Potential, Field of a Line Charge, Field of a Sheet of Charge, Electric Flux, Electric Flux Density, Gauss's Law and its applications, Boundary conditions for Electric Field. Method of Images, Poisson's and Laplace's Equations, Uniqueness Theorem.

Unit-II

MAGNETOSTATICS: Differential Current Element, Biot - Savart Law. Magnetic field of a linear conductor of infinite length. Magnetic field of a circular current carrying loop. Magnetic Vector potentials, Magnetic Circuit, Force on a moving charge in magnetic field, Force on a Current Carrying Conductor in Magnetic Field, Torque on a closed current carrying loop in magnetic field. Magnetic flux and Magnetic flux density. Ampere's Circuit law, Faraday's Law, Boundary Conditions for Magnetic field, Maxwell's Equations for Free space, Good Conductors & Lossy Dielectric for Static & Sinusoidal Time Variations Fields, Retarded potentials.

Unit-III

UNIFORM PLANE WAVE: Plane Waves & its properties, Uniform Plane waves, Wave Equation for Free Space and Conducting Medium, Propagation of Plane Waves in Lossy Dielectrics, Good Dielectrics & Good Conductors. Skin effect and Skin depth for different medium. The Poynting's Vector and Poynting theorem. Reflection of plane waves from perfect conductors and dielectrics under normal and oblique incidence.

Unit-IV

TRANSMISSION LINES AND WAVEGUIDES: Representation of transmission line. Reflection in Transmission Line. The Transmission Line Equations, Graphical methods for solving transmission line. Rectangular Waveguides: TE, TM, TEM waves in rectangular wave guide, Calculation of field in rectangular waveguide foe TE and TM mode. Cut-off & Guided frequency of waveguide.

REFERENCES:

1 E.C. Jordan & K.G. Balmain ,"Electromagnetic Waves and Radiating Systems, 2nd Edition, PHI
2 David K. Chang, "Field and Waves Electromagnetics" 2nd Edition, Addison Wesley.
3 W. H. Hayt, "Engineering Electromagnetics", 7th Edition, Tata McGraw Hill.
5. Matthew N. O. Sadiku and S. V. Kulkarni, "Principles of Electromagnetics", 6th Edition, Oxford University Press.

B24- ECE 208	**Verilog HDL**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**-**	**-**	**3**	**70**	**30**	**100**	**3**
Purpose	To familiarize the students with the conventions of the Verilog HDL programming.						
Course Outcomes **At the end of this course, student will be able to**							
CO 1	To understand the constructs and conventions of the Verilog HDL programming.						
CO 2	To understand the structural, register-transfer level (RTL), and algorithmic levels of abstraction for modelling digital hardware systems.						
CO 3	To design and modelling of combinational and sequential digital systems						
CO 4	To apply the concept of test-benches to create testing behavioral environments for simulation based verification.						

Unit- I

Introduction: Introduction, conventional approach to digital design, VLSI design, ASIC design flow, Role of HDL, Conventional Data flow, ASIC data flow, Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools, Test Benches.
Language constructs and conventions: Introduction, Keywords, Identifiers, White Space Characters,
Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Memory, Operators, System Tasks.

Unit-II

Gate level modelling: Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flip-flops with Gate Primitives, Delays, Strengths and Contention Resolution, Net Types, Design of Basic Circuits.
Behavioral modelling: Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Examples, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-blocking Assignments, The case statement, Simulation Flow, if and ifelse constructs, assign-deassign construct, repeat construct, for loop, the disable construct, while loop, forever loop, parallel blocks, force-release construct, Event.

Unit-III

Modelling at data flow level: Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Additional Examples.
Switch level modelling: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets.

Unit-IV

Functions, tasks, and user defined primitives: Introduction, Function, Tasks, User- Defined Primitives (UDP), FSM Design (Moore and Mealy Machines).
System tasks, functions, and compiler directives: Introduction, Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Compiler Directives, Hierarchical Access, General Observations.

Text Books:

1. T. R. Padmanabhan, B. Bala Tripura Sundari (2004), Design through Verilog HDL, Wiley & Sons Education, IEEE Press, USA.
2. J. Bhaskar (2003), A Verilog Primier, 2nd edition, BS Publications, India.

Reference Books:

1. Samir Palnitkar (2013), Verilog HDL, Pearson India.
2. Stephen. Brown, ZvonkoVranesic (2005), Fundamentals of Logic Design with Verilog, Tata McGraw
Hill, India.
3. Charles H. Roth (2004), Digital Systems Design using VHDL, Jr. Thomson Publications, India.

B24-ECE-210	**Analog Circuits Lab**						
Lecture	Tutorial	Practical	Credit	Practical Exam	Internal Assessment	Total	Time
_____	---	3	1.5	60	40	100	3 Hrs
Purpose	To impart the practical knowledge of analog circuits and their applications						
Course Outcomes (CO)							
CO1	To design and calculate the gain , frequency response etc. of the various configuration of transistor amplifier.						
CO2	To make students Design various RC oscillators using Op-Amp 741 for a given frequency of oscillation.						
CO3	To make students Design various RC oscillators using BJT for a given frequency of oscillation.						
CO4	To teach the students the design of various Op-Amp circuits such as adder, subtractor etc.						

List of experiments:

1 To design a simple common emitter (CE) amplifier circuit using BJT and find its gain and frequency response.
2 To design a BJT emitter follower and determine is gain, input and output impedances.
3 To design and test the performance of Phase shift Oscillator using Op-Amp 741.
4 To design and test the performance of Wien bridge oscillator using Op-Amp 741.
5 To design and test the performance of BJT - RC Phase shift Oscillator for $f0 \leq 10$ KHz.
6 To design and test the performance of BJT – Hartley Oscillators for RF range $f0 \geq 100$KHz.
7 To design and test the performance of BJT – Colpitt Oscillators for RF range $f0 \geq 100$KHz.
8 To design an astable multivibrator using 555 timer.
9 To design a monostable multivibrator using 555 timer.
10 To design Schmitt trigger using Op-amp and verify its operational characteristics.
11 To design an adder circuit using Op-Amp to add three dc voltages.
12 To design a subtractor using Op-Amp to subtract DC voltages v1 and v2.

Reference Books:

1. Millman & Halkias: Integrated Electronics, TMH.
2. Boylestad & Nashelsky: Electronic Devices & Circuit Theory, PHI.

Note: Atleast eight (8) experiments from the above list are mandatory to perform for the students

B24-ECE-212	**Electromagnetic Waves Lab**						
Lecture	Tutorial	Practical	Credit	Practical Exam	Internal assessment	Total	Time
-	-	3	1.5	60	40	100	3 Hrs.
Course Outcomes (CO)							
CO1	To understand the concept of basic scattering parameters required to characterize the RF device.						
CO2	To be able to Design & Characterize the Microstrip Transmission line						
CO3	To be able to Design & Characterize the Rectangular and Circular Waveguide.						
CO4	To Design & Characterize the monopole, dipole antenna and patch antenna						

List of Experiments:

1. Introduction to simulation software for Electromagnetic.
2. To study the basics of scattering parameters required to characterize a RF device. .
3. Design & Characterization of Microstrip line using simulation software.
4. Design & Characterization of Rectangular Waveguide using simulation software.
5. Design & Characterization of Circular Waveguide using simulation software.
6. To study the propagation of signal in good conductor using simulation software.
7. Design & Characterization of monopole antenna.
8. Design & Characterization of dipole antenna.
9. Design & Characterization of microstrip patch antenna.
10. Design & Characterization of probe feed patch antenna.

B24-ECE-214	**Microprocessor & Interfacing Lab**						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical exam**	**Total**	**Time**
0	**0**	**3**	**1.5**	**40**	**60**	**100**	**3 Hour**
Purpose	**Write the efficient Assembly Language Program for different problem statements and implement different system interfacing.**						
Course Outcomes							
CO 1	**Understanding different steps to develop program such as Problem definition, Analysis, Design of logic, Coding, Testing, Maintenance (Modifications, error corrections, making changes etc.)**						
CO 2	**To be able to apply different logics to solve given problem.**						
CO 3	**To be able to write program using different implementations for the same problem**						
CO 4	**Use of programming language constructs in program implementation**						

LIST OF EXPERIMENTS: (Verification of atleast 3 experiments may also be done using TASM)

I a) Familiarization with 8086 Trainer Kit.
b) Familiarization with Digital I/O, ADC and DAC Cards.
c) Familiarization with Turbo Assembler and Debugger S/Ws.

II Write a program to arrange block of data in
i) ascending and (ii) descending order.

III Write a program to find out any power of a number such that $Z = X^N$.
Where N is programmable and X is unsigned number.

IV Write a program to generate.
i) Sine Waveform (ii) Ramp Waveform (iii) Triangular Waveform Using DAC Card.

V Write a program to measure frequency/Time period of the following functions.
(i) Sine Waveform (ii) Square Waveform (iii) Triangular Waveform using ADC Card.

VI Write a program to increase, decrease the speed of a stepper motor and reverse its direction of rotation using stepper motor controller card.

VII Write a programmable delay routine to cause a minimum delay = 2MS and a maximum delay = 20 minutes in the increments of 2 MS

VIII Write a program that takes any two numbers as Input from the user through the input device (Keyboard) & Prints their sum on the standard output device (Screen).

IX Write a program that takes any two numbers as Input from the user through the input device (Keyboard) & Prints their sum on the standard output device (Screen) by giving appropriate messages to the user

X Write a program that initializes 100 positions in an array and loads them with 0.

XI Write a program that prints a Blinking character in the middle of the screen.

XII Write a program that accepts a number from the user through the input device(Keyboard), calculates its factorial and prints the result on the screen.

XIII ON/OFF control of SSR (Solid State Relay) using interface with 8255.

XIV Interfacing of LM35/RTD temperature sensor with 8086 and display the temp value on LCD.

XV To interface traffic light system using 8086 & 8255.

B24-ECE-216	**Electronic design Workshop**						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical exam**	**Total**	**Time**
0	**0**	**3**	**1.5**	**40**	**60**	**100**	**3 Hour**
Purpose	**To design and develop any hardware based electronics projects.**						

Course Outcomes **At the end of the course, student will be able to**	
CO 1	**Identify different electronics components**
CO 2	**Design PCB**
CO 3	**Design an electronic circuit**
CO 4	**Develop a working project model**

Instructions:

All the students will be required to design and develop any hardware based electronic project approved by the concerned Faculty In-charge/ Head of Department.

B24- ECE 218	**Verilog HDL Lab**						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical Exam**	**Total**	**Time**
-	**-**	**2**	**1**	**40**	**60**	**100**	**3**
Purpose	To familiarize the students with the conventions of the Verilog HDL programming.						
Course Outcomes **At the end of this course, student will be able to**							
CO 1	To describe, design, simulate, and synthesize circuits using the Verilog hardware description language.						
CO 2	To design and modelling of combinational and sequential digital systems.						
CO 3	To develop program codes for synthesis-friendly combinational and sequential logic circuits.						
CO 4	To understand the advanced features of Verilog HDL and be able to write optimized codes for complex systems.						

List of Experiments:

1. Write a Program to implement logic gates.
2. Write a Program to implement half-adder.
3. Write a Program to implement full-adder.
4. Write a Program to implement 4 bit addition/subtraction.
5. Write a Program to implement a 3:8 decoder.
6. Write a Program to implement an 8:1 multiplexer.
7. Write a Program to implement a 1:8 demultiplexer.
8. Write a Program to implement 4 bit comparator.
9. Write a Program to implement Mod-10 up counter.
10. Write a program to perform serial to parallel transfer of 4 bit binary number.
11. Write a program to perform parallel to serial transfer of 4 bit binary number.
12. Write a program to implementa8 bit ALU containing 4 arithmetic & 4 logic operations.

Note: At least ten experiments from the above list are mandatory to perform for the students.

B24-MAC-202	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (Hrs.)**
2	**0**	**0**	**1**	**--**	**100**	**100**	**3**
Purpose	To impart basic principles of thought process, reasoning and inferencing.						
Course Outcome							
CO 1	*The students will be able to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.*						

Course Contents

- Basic structure of Indian Knowledge System: अष्टादशविद्या -४वेद,४उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थापत्य आदि) ६वेदांग (शिक्षा, कल्प, निरुक्त, व्याकरण, ज्योतिष, छंद) ४ उपाङ्ग (धर्मशास्त्र, मीमांसा, पुराण, तर्कशास्त्र)
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

References

- V. Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
- Swami Jitatmanand, *Modern Physics and Vedant*, Bharatiya Vidya Bhavan
- Swami Jitatmanand, *Holistic Science and Vedant*, Bharatiya Vidya Bhavan
- Fritzof Capra, *Tao of Physics*
- Fritzof Capra, *The Wave of life*
- VN Jha (Eng. Trans.), *Tarkasangraha of Annam Bhatta*, International Chinmay Foundation, Velliarnad, Arnakulam
- *Yoga Sutra of Patanjali*, Ramakrishna Mission, Kolkata
- GN Jha (Eng. Trans.), Ed. RN Jha, *Yoga-darshanam with Vyasa Bhashya*, Vidyanidhi Prakashan, Delhi 2016
- RN Jha, *Science of Consciousness Psychotherapyand Yoga Practices*, Vidyanidhi Prakashan, Delhi 2016
- P B Sharma (English translation), *Shodashang Hridayan*

Pedagogy: Problem based learning, group discussions, collaborative mini projects.