B.Tech.Electronics and Communications Engineering (ECE)

KURUKSHETRAUNIVERSITY,KURUKSHETRA

Modified scheme of exams w.e.f. session 2024-25

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	B23-HSM-202	Innovation, Startups and Entrepreneurship	3:0:0	3	3	70	30	--	100	3
2	B23-ECE-202	Advanced Microprocessors and Interfacing	3:0:0	3	3	70	30	--	100	3
3	B23-ECE-204	Analog Circuits	3:0:0	3	3	70	30	--	100	3
4	B23-ECE-206	Electromagnetic Waves	3:0:0	3	3	70	30	--	100	3
5	B23-ECE-208	Verilog HDL	3:0:0	3	3	70	30	--	100	3
6	B23-ECE-210	Analog Circuits Lab	0:0:3	3	1.5	--	40	60	100	3
7	B23-ECE-212	Electromagnetic Waves Lab	0:0:3	3	1.5	--	40	60	100	3
8	B23-ECE-214	Microprocessor& Interfacing Lab	0:0:3	3	1.5	--	40	60	100	3
9	B23-ECE-216	Electronic Design Workshop	0:0:3	3	1.5	--	40	60	100	3
10	B23-ECE-218	Verilog HDL Lab	0:0:2	2	1	--	40	60	100	3
11	B23-MAC-202	Essence of Indian Traditional Knowledge	2:0:0	2	1	--	100	--	100	3
TOTAL				31	23	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.

B23-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

B23-ECE-202	Advanced Microprocessors and Interfacing						
Lecture	Tutorial	Practical	Credit	End Semester Exam	Internal Assessment	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 8237.

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.

B23-ECE-204	**Analog Circuits**						
Lecture (Hrs.)	Tutorial (Hrs.)	Practical (Hrs.)	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 monostablemultivibrator.

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.

B23-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 thegeneration and propagation of electric field in different media.*						
CO2	*Students will be able to understand and apply the basic laws of Magnetostatics for thegeneration and propagation of magnetic field in different media.*						
CO3	*Students will be able to understand and develop the relations between Electric field andMagnetic 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.

4. Matthew N. O. Sadiku and S. V. Kulkarni, "Principles of Electromagnetics", 6th Edition, Oxford University Press.

B23- 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.

B23-ECE-210	**Analog Circuits Lab**						
Lecture (Hrs.)	Tutorial (Hrs.)	Practical (Hrs.)	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 ≤ 10 KHz.
6 To design and test the performance of BJT – Hartley Oscillators for RF range f0 ≥100KHz.
7 To design and test the performance of BJT – Colpitt Oscillators for RF range f0 ≥100KHz.
8 To design an astablemultivibrator using 555 timer.
9 To design a monostablemultivibrator 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

B23-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.

B23-ECE-214	Microprocessor& Interfacing Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical exam**	**Total**	**Time**
0	**0**	**3**	**1.5**	**40**	**60**	**100**	**3Hour**
Purpose	**WritetheefficientAssemblyLanguageProgramfordifferentproblemstatementsandimplementdifferentsysteminterfacing.**						
CourseOutcomes							
CO 1	**Understanding different steps to develop program such as Problem definition,Analysis,Design of logic, Coding, Testing, Maintenance (Modifications, errorcorrections, makingchangesetc.)**						
CO 2	**Tobeabletoapplydifferentlogicstosolvegivenproblem.**						
CO 3	**Tobeabletowriteprogramusingdifferentimplementationsforthesameproblem**						
CO 4	**Useofprogramminglanguageconstructsinprogramimplementation**						

LISTOFEXPERIMENTS:(Verificationofatleast3experimentsmayalsobedoneusingTASM)

I a)Familiarizationwith8086TrainerKit.
b) FamiliarizationwithDigitalI/O,ADCandDACCards.
c) FamiliarizationwithTurboAssemblerandDebuggerS/Ws.

II Writeaprogramtoarrangeblockofdatain
i) ascendingand(ii)descendingorder.

III Writeaprogramtofindoutanypowerofanumbersuchthat$Z=X^N$.Where
N isprogrammableandXisunsigned number.

IV Writeaprogramtogenerate.
i) SineWaveform (ii)RampWaveform(iii)TriangularWaveformUsingDACCard.

V Writeaprogramtomeasurefrequency/Timeperiodofthefollowingfunctions.
(i)SineWaveform(ii)SquareWaveform(iii)TriangularWaveformusingADCCard.

VI Writeaprogramtoincrease,decreasethespeedofasteppermotor
andreverseitsdirectionofrotationusingstepper motorcontrollercard.

VII Writeaprogrammabledelayroutinetocauseaminimumdelay=2MSandamaximumdelay
=20minutesintheincrementsof2MS

VIII Write a program that takes any two numbers as Input from the user through the input device(Keyboard)&Printstheirsumonthestandardoutput 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 givingappropriatemessagestotheuser

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

XI WriteaprogramthatprintsaBlinkingcharacterinthemiddleofthescreen.

XII Writeaprogramthatacceptsanumberfromtheuserthroughtheinput device(Keyboard),calculatesitsfactorialandprintstheresultonthescreen.

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.

B23-ECE-216	**Electronic design Workshop**						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical exam**	**Total**	**Time**
0	**0**	**3**	**1.5**	**40**	**60**	**100**	**3Hour**
Purpose	**To design and develop any hardware based electronics projects.**						
CourseOutcomes **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.

B23- 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 hardwaredescription 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 logiccircuits.						
CO 4	To understand the advanced features of Verilog HDL and be able to write optimizedcodes 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.

B23-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.						
CourseOutcome							
CO 1	*The students will be able to understand, connect up and explain basics of Indiantraditional 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.