।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

Phone: (02462) 229542
Fax : (02462) 229574

Website: www.srtmun.ac.in

E-mail: bos.srtmun@gmail.com

संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्याशाखेने **दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व दिनांक १२ जून २०२१ रोजी संपन्न झालेल्या ५१ व्या मा. विद्या परिषद बैठकीतील विषय क्र. २६/५१–२०२१**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

1. B.Sc.-III Year-Biophysics
2. B.Sc.-III Year-Bioinformatics
3. B.Sc.-III Year-Biotechnology
4. B.Sc.-III Year-Biotechnology (Vocational)
5. B.Sc.-III Year-Botany
6. B.Sc.-III Year-Horticulture
7. B.Sc.-III Year-Agro Chemical Fertilizers
8. B.Sc.-III Year-Analytical Chemistry
9. B.Sc.-III Year-Biochemistry
10. B.Sc.-III Year-Chemistry
11. B.Sc.-III Year-Dyes & Drugs Chemistry
12. B.Sc.-III Year-Industrial Chemistry
13. B.C.A. (Bachelor of Computer Application)-III Year
14. B.I.T. (Bachelor of Information Technology)-III Year
15. B.Sc.-III Year-Computer Science
16. B.Sc.-III Year-Network Technology
17. B.Sc.-III Year-Computer Application (Optional)
18. B.Sc.-III Year-Computer Science (Optional)
19. B.Sc.-III Year-Information Technology (Optional)
20. B.Sc.-III Year-Software Engineering
21. B.Sc.-III Year-Dairy Science
22. B.Sc.-III Year-Electronics
23. B.Sc.-III Year-Environmental Science
24. B.Sc.-III Year-Fishery Science
25. B.Sc.-III Year-Geology
26. B. A./B.Sc.-III Year-Mathematics
27. B.Sc.-III Year-Microbiology
28. B.Sc.-III year Agricultural Microbiology
29. B.Sc.-III Year-Physics
30. B. A./B.Sc.-III Year Statistics
31. B.Sc.-III Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२१–२२/७५

दिनांक : १२.०७.२०२१.

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
७) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

CLASS: B. Sc. THIRD YEAR

Subject: Electronics - Semester V&VI

(W. e. f. June 2021)

Semester	Paper No	Name of Course	Instruction Hours/ Week	Total periods	CA	ESE	Total Marks	Credits
V	DECE-I (Section A)	Communication Electronics-I (P-XII) (Compulsory)	03	45	10	40	50	02
	DECE-I [(Section B) Elective]	Power Electronics-I (P-XIII- A) OR C Programming (P-XIII-B)	03	45	10	40	50	02
	SEC-III	SEC-III(A): Linear Circuit Designing OR SEC-III(B): PCB Designing	03	45	25	25	50	02
VI	*DECE-II (Section A)	Communication Electronics-II (P-XIV) (Compulsory)	03	45	10	40	50	02
	DECE-II [(Section B) Elective]	Power Electronics-II (P-XV-A) OR Electronic Instrumentation (P- XV-B)	03	45	10	40	50	02
	SEC-IV	SEC-IV(A): Digital Logic Design OR SEC-IV(B): Embedded System Design	03	45	25	25	50	02
V & VI	DECEP-I (Section A)	P-XVI	03	24	05	20	25	1
		Practicals based on P-XII						
		Practicals based on P-XIV	03	24	05	20	25	1
	DECEP II (Section B)	P-XVII	03	24	05	20	25	1
		Practicals on P- XIII (A or B)						
		Practicals on P-XV (A or B)	03	24	05	20	25	1
Total credits								16

*DECE – Discipline Specific Elective Course in Electronics

DECE-IA (Paper-XII): Communication Electronics-I

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: P-VI: Amplifiers & P-VIII: Oscillators & Multivibrators

Course Objectives:

1. To introduce to wireless communication systems.
2. To study analogue modulation techniques.
3. To understand the basics of analogue pulse modulation.
4. To study digital pulse modulation.

Course Outcome:

1. Understanding of communication systems.
2. Working of analogue modulation techniques.
3. Understanding of analogue pulse modulation.
4. Understanding of digital pulse modulation.

Unit I: Basics of Communication Systems (07 periods)

Introduction, Block diagram of Communication System, Classification of Communication Systems: Direction, Nature of signal and Technique of transmission, Need for Modulation, Types of Modulation, Bandwidth. (Numerical Problems)

Unit II: Amplitude Modulation (18 periods)

Amplitude Modulation Theory, Mathematical representation of AM wave, Modulation index, Frequency spectrum of AM wave, Bandwidth of AM, Power relations in AM wave, AM circuits: Basic circuit for BJT Collector modulation, Amplitude demodulator circuit. (Numerical Problems)

Unit III: Frequency Modulation (10 periods)

Theory of Frequency modulation, Mathematical Representation of FM wave, Band width, Generation of FM, Direct method for FM generation, Transistor reactance modulator, Varactor reactance modulator. (Numerical Problems)

Unit IV: Pulse Modulation (10 periods)

Introduction, Classification of Pulse modulation systems, Sampling theorem, Nyquist criteria, Basic principles of Pulse-Amplitude modulation (PAM), Pulse-Width modulation (PWM), Pulse-Position modulation (PPM), Generation and detection of PAM only, **Digital pulse modulation**: Pulse-Code modulation (PCM) PCM transmitter, PCM receiver and quantization process, quantization error, application, advantages and disadvantages of PCM. (Numerical Problems)

References:

1. Electronic Communications, Dennis Roddy and John Coolen (Fourth Edition),PHI Publication.
2. Electronic Communication Systems, George Kennedy, (Third Edition), Mc GrawHill International Edition.
3. Communication Engineering, J.S. Katre, Technova Educational Publications, Pune.

DECE-I B (Paper-XIII (A)): Power Electronics – I

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: P-III: Semiconductor Devices and Electronic Instruments

Course Objectives:

1. To introduce thyristor family.
2. To study Power Semiconductor Devices SCR, DIAC, TRIAC, PMOSFET, IGBT
3. To study different triggering circuits.
4. To study SCRs in series and parallel

Course Outcome:

1. Working of SCR, DIAC, TRIAC, PMOSFET, IGBT.
2. Knowledge of thyristor triggering circuits.
3. Understanding issues with series and parallel operation of thyristers.

UNIT -I : Thyristor : Principles and characteristics : (13periods)

Principle of operation of SCR, Static Anode - Cathode Characteristics of SCR, The two transistor model of SCR, Thyristor Construction, gate characteristics of SCR, Turn on methods of a thyristor. [Numerical]

UNIT – II : Power semiconductor devices : **(**10 periods)

Power semiconductor devices, structure and V-I characteristics of DIAC, TRIAC, Power MOSFET & IGBT, Symbol and V-I characteristics of SUS, SBS, SCS & LASCR (Numericals)

UNIT – III : Gate triggering circuits : (10 periods)

Introduction, firing of thyristors, gate current amplitude and rise time, gate pulse duration, pulse waveforms, Pulse transformers, pulse transformer in triggering circuits, Gate trigger circuits, resistance firing circuits, resistance - capacitance firing circuit, resistor - Capacitor - full - wave trigger circuit, UJT as an SCR trigger [Numerical]

UNIT - IV: Series and parallel operation of Thyristors : (12 periods)

Introduction, series operation of Thyristors, need for equalizing network, unequal distribution of voltage, difference in reverse recovery characteristics, equalizing network design, static equalizing network, dynamic equalizing network, parallel operation of thyristors, methods for ensuring proper current sharing, string efficiency, derating (Numericals)

References:

1) Power Electronics, M.D. Singh & K.B. Khanchandani (2nd Edition), Mc Graw Hill - education.
2) Power Electronics, Muhammad H. Rashid (4th edition), Pearson.
3) Power Electronics (Revised edition), K. Haribabu, Scitech Publication.
4) Industrial Electronics & Control, S.K. Bhattacharya, S. Chatterjee, TTTI, Chandigarh
5) Power electronics, P.C. Sen, Mc Graw Hill – education

DECE-I B (Paper-XIII (B)): 'C' Programming

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: Any BSc SY Electronics pass.

Course Objectives:

1. To know basics of C programming language.
2. To learn various features of C programming language.
3. To acquire C programming skill.

Course Outcome:

1. Knowledge of basics of C programming language.
2. Understanding of control statements, arrays, functions and pointers.
3. C programming skill.

Unit-I: **C Fundamentals** (11 Lectures)

Introduction, character set, C tokens, constants and variables, keywords and identifiers, Data types, declaration of variables, assigning values to variables, symbolic constants, simple and formatted Input/ Output statement, operators in 'C' and structure of 'C' program.

Unit-II: **Control Statements** (10 Lectures)

Decision making and branching: If statement, If-else statement, Nesting of If- Else statement, Switch statement, goto statement. Looping Statements: Introduction, While, Do- while and For loop statement, nested loop.

Unit-III: Arrays, Functions and String Functions (12 Lectures)

Introduction, types of Arrays, declaration and initialization of arrays, Introduction to functions, definition, return values and their types, function calls, category of functions, recursion. Standard library string functions for string length, string copy, string compare and string concatenation.

Unit-IV: **Pointers, Structure and Union** (12 Lectures)

Pointers, declaring and initializing pointers, accessing variables through pointers, pointers and arrays. Introduction to Structure and Union, structure declaration, accessing and initialization.

Reference Books:

1. Programming in 'C' by E Balaguruswamy: TMH Pub. Comp. Ltd., New Delhi
2. Let US C by Yeswant Kanetkar
3. Programming with 'C' by Byron Gottfried, Schaum's outlines, TMH Pub. Comp. Ltd., New Delhi
4. The Complete Reference 'C' by Herbert Schildt, TMH Pub. Comp. Ltd., New Delhi
5. The C-Programming language, Brian Kernighan, & Dennis Ritchie, Pearson Education India.

Web Resources:

1. www.spoken-tutorial.org
2. www.onlinecourses.nptel.ac.in
3. https://www.programiz.com/c-programming/examples
4. https://www.javatpoint.com/c-programs
5. https://www.tutorialspoint.com/cprogramming/index.htm

Skill Enhance Course –III (A): Linear Circuit Designing

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: B.Sc. SY Electronics pass.

Course Objectives:

1) To know basics of some electronic components and circuits of practical importance.
2) To equip the students with skill of circuit designing for a given requirement.
3) To impart hands on practice: circuit assembling, testing and troubleshooting.

Unit I: **(Periods: 10)**

LED interfacing to given source, designing of buffer for LED interfacing with ICs such as 7476, 8255 etc., voltage clipper, voltage clamper, designing of single stage C-E amplifier (class A).

Unit II: **(Periods: 15)**

Designing of Colpitt's oscillator, Phase-shift oscillator, designing of fixed voltage regulators using ICs 78XX and 79XX, study of load regulation and line regulation of a given power supply, designing of constant current source.

Hands-on Exercises: **(20 Lectures)**

1) Design the circuit to interface LED of Vd = ----- V, to a voltage source V = ---- V. Take maximum LED current 10 mA.
2) Design the buffer amplifier to interface LED to some TTL chip operating at 5 V and can source only 40 micro ampere. Take Vd = ---- V and Id = 10 mA.
3) Design voltage clipper to clip the given waveform at V = + -- V or – --- V.
4) Design waveform clamper to clamp the given waveform at V = +2V
5) Design single stage RC coupled CE amplifier for the gain of A = - 10.
6) Design and build the fixed voltage regulator for Vo = +5V / 1 A, using IC 7805
7) Design and build the split-power supply for Op-Amp = +12V n -12V using ICs 7812 and 7912.
8) Study the load regulation of given power supply.
9) Study the line regulation of given power supply.
10) Design and build the constant current source of 1 mA, operating at =12V for the load which varies over 0 - 5 KΩ.
11) Design and build the Colpitts oscillator / RC Phase shift oscillator for a given frequency.

Reference Books:

1. *Electronic Principle* -by Albert Malvino, David J. Bates, 7th Edition, TMH, 2007 (5th Reprint,2008)
2. *Grob's Basic Electronics* -by Mitchel E. Schultz, 10th Edition, TMH, New Delhi, Rs 585/-
3. *Electronic Devices and Circuits* -by I. J. Nagrath, PHI, 2007, Rs 325/-
4. *Electronic Devices* -by Thomas Floyd, 6th Edition(4th Reprint), PEARSON Education, 2005

Web Resources:

1. https://www.electronics-tutorials.ws/diode/diode_8.html
2. https://www.elprocus.com/types-of-clipper-and-clamper-circuits-and-application/
3. https://www.electronics-tutorials.ws/amplifier/amp_2.html
4. https://www.engineersgarage.com/contribution/ambhatt/how-to-design-regulated-power-supply
5. http://www.radio-electronics.com/info/circuits/transistor/active-constant-current-source.php

Skill Enhance Course –III (B): PCB Designing

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: B.Sc.SY Electronics pass.

Course Objectives:

1. To equip students with circuit drawing.
2. To know various steps involved in PCB production.
3. To know and handling of various tools and software used for PCB designing.

Course Outcome :

On completion of this course, students can -

1. Knowledge of PCB Designing.
2. Skill of assembling, soldering, de-soldering on PCB.

UNIT-I: PCB Designing **(15 Lectures)**

Introduction to PCB: Evolution & Classification, Manufacturing of PCB: Single sided and double sided, Layout planning and design: Reading drawings and diagrams, General PCB design considerations, Conductor patterns, Component placement Rules.

UNIT-II Soldering Methods **(15 Lectures)**

What is soldering, theory of soldering, Soldering variables, Soldering material, Soldering and Brazing, Soldering tools, Other hand soldering tools, Hand soldering: Requirements & steps, Health and safety Aspects, De-soldering techniques, Etching techniques: Immersion etching, drilling: drill bit geometry and its importance.

Hands-on Exercises: **(15 Lectures)**

1. Drilling and Soldering Practice.
2. Layout printing on copper clad.
3. Designing of PCB through etching.
   Preparing PCB for
   i. Half Wave Rectifier
   ii. Full wave Rectifier
   iii. Capacitor filter
   iv. Single stage CE amplifier
   v. NAND gate using 7400
   vi. NOR gate using 7402
   vii. Basic gates using NAND gate

Recommended Books:

1. Printed circuit boards: design, fabrication, assembly and testing- R.S. Khandpur
2. Electronic Product Design- Er. S. D. Mehta, Volume-I, S. Chand Publications.

DECE-II A (Paper-XIV): Communication Electronics – II

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: P-XII: Communication Electronics-I

Course Objectives:

1. To study basics of Radio Receivers.
2. To understand the basics about the Microwaves.
3. To learn the RADAR systems
4. To Study the concepts in Mobile communication, Fiber optic communication

Course Outcome:

1. Understanding of Radio Receivers.
2. Knowledge of basics of Microwaves.
3. Knowledge of basics of RADAR systems
4. Understanding of basics of Mobile communication and optical fibers.

Unit I: Radio Receivers (10 periods)

Introduction, Basic block diagram of communication receiver, Tuned Radio Frequency (TRF) Receiver, Super Heterodyne Receiver, Characteristics of Radio receivers, Sensitivity, Selectivity, Fidelity, Image frequency and its rejection, Double spotting. (Numerical Problems)

Unit II: Microwaves & Radar Systems (15 periods)

Introduction to microwave properties and applications of microwaves, Basic principles of radar system, Block diagram of basic pulsed radar system, Radar range equation, Moving target indication, CW Doppler radar. (Numerical Problems)

Unit III: Introduction to Mobile Communication (5 Periods)

Historical perspectives, Cellular Systems, Third Generation (3G) Systems, Fourth-Generation (4G) Systems.

Unit IV: Introduction to Optical Fibres (15periods)

Fibre Optics, Structure of Optical Fibres, Classification of Optical Fibres, Propagation of Light, Refraction and Snell's law, Total Internal Reflection, Light Propagation through an OpticalFibre, Acceptance Angle and Numerical Aperture, Dispersion, Intermodal Dispersion, Fibre Characteristics, Fibre Losses, Calculation of Losses, Choice of Wavelength, Fibre Optic Communications, Applications of Fibre Optic Communication, Advantages of Optic Fibres, Disadvantages of Optic Fibres.(Numerical Problems)

References:

1. Electronic Communications, Dennis Roddy and John Coolen (Fourth Edition), PHI Publication.
2. Electronic Communication Systems, George Kennedy, (Third Edition), McGraw Hill International Edition.
3. Microwave Engineering-Sanjeeva and Gupta
4. Optical Fibres and Fibre Optic Communication Systems, S.K. Sarkar, S.Chand and Company Ltd., New Delhi.
5. Optical Fiber Communications: Principles & Practice – John M Senior, III edition PHI
6. Communication Engineering, J.S. Katre, Technova Educational Publications, Pune.
7. Basic Electronics (Solid State) [Multicolour Illustrative Edition] B.L. Theraja (S. Chand &Co. Ltd.)
8. Mobile Satellite Communication Networks: Ray E. Sherrif& Y. Fun Hu (Wiley India)
9. Wireless & Cellular Telecommunications: -Wiliam C. Y. Lee (3/e, McGraw Hill)
10. Wireless Communications, Andrea Goldsmith, Cambridge University Press, 2015.
11. Web Reference: 1G, 2G, 3G, 4G, 5G –by Simon Johansen (http://its-wiki.no/images/c/c8/From_1G_to_5G_Simon.pdf)

DECE-II B (Paper-XV(A)): Power Electronics – II

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: P-XIII(A): Power Electronics-I

Course Objectives:

1. To study Controlled converters.
2. To understand working of power control circuits.
3. To study working of choppers.
4. To study working of inverters.

Course Outcome:

1. Knowledge of working of controlled rectifiers with R, R-L loads.
2. Understanding of power control circuits.
3. Knowledge of working of choppers and inverters.

UNIT – I : Phase controlled Converters (17 periods)

Introduction, control techniques, phase angle control, extinction angle control, pulse width modulation control, Single-phase full-wave controlled rectifier (Two-quadrant Converters): Mid-point converters (M-2 Connection) with resistive lead, with inductive load, effect of freewheeling diode, Bridge configuration (B-2 connection) with resistive load, with inductive load (R-L load) Single-Phase half controlled Bridge rectifier: Half controlled bridge rectifier with resistive load (symmetrical configuration), Half controlled Bridge rectifier with R-L load. (Symmetrical configuration) [Numerical]

UNIT - II : Thyristor Control Circuits (10 periods)

Introduction, phase - control circuits for regulating temperature, remote temperature controller, Illumination control using DIAC & TRIAC, Light activated turnoff circuit using DIAC, TRIAC and LDR, OFF at dark circuit, emergency light using SCR, Automatic water level indicator using SCR

UNIT – III : Choppers (10 periods)

Introduction, Basic chopper classification, Basic chopper operation: Principle of step down chopper (buck converter), principle of step up chopper, Control Strategies : Time Ratio control (TRC) current limit control. [Numerical]

UNIT - IV : Inverters : (8 Periods)

Introduction, classification of Inverters, Series Inverters: Basic series inverter, modified series inverter, parallel inverter [Numerical]

References:

1) Power Electronics, M.D. Singh & K.B. Khanchandani (2^{nd} Edition), Mc Graw Hill - education.
2) Power Electronics, Muhammad H. Rashid (4^{th} edition), Pearson.
3) Power Electronics (Revised edition), K. Haribabu, Scitech Publication.
4) Industrial Electronics & Control, S.K. Bhattacharya, S. Chatterjee, TTTI, Chandigarh
5) Power electronics, P.C. Sen, Mc Graw Hill – education

DECE-II B (Paper-XV(B)): Electronic Instrumentation

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: BSc SY Electronics pass.

Course Objectives:

1. To introduce to performance characteristics, static characteristics, dynamic characteristics, errors, international standards.
2. To understand working of various transducers.
3. To study signal conditioning and digital instruments.

Course Outcome:

1. Knowledge of characteristics, errors, standards.
2. Working of transducers and their uses.
3. Ability to choose proper transducer.
4. Knowledge of uses of various digital instruments.

Unit- I: Introduction **Periods: 10**

Introduction, Performance characteristics, static characteristics error in measurement, types of errors, sources of errors, dynamic characteristics, standard and international standards. (Problems)

Unit-II: Transducers-I **Periods: 11**

Introduction, Electrical transducer, selecting a transducer, Resistive transducer: Potentiometer, resistance pressure transducer, Strain gauges: resistance wire gauges, types of strain gauges (list), Inductive transducer, Differential output transducer, Linear variable differential transducer (LVDT). (Problems)

Unit-III: Transducers-II **Periods: 13**

Capacitive transducer(pressure), load cell (pressure cell), piezo electric transducer, Photo electric transducer: photo conductive cells or photo cell, photo voltaic cell, semiconductor photo diode, photo-transistor, Resistance Thermometer, thermistor, Resistance Temperature detectors, thermocouples. (Problems)

Unit IV: Signal conditioning and Digital instruments **Periods: 11**

Sample Hold circuit, Precision rectifier, V to I converter, I to V converter, Instrumentation amplifier. Block diagram of basic digital Multimeter, basic circuit of digital frequency meter, block diagram of digital Tachometer and digital pH meter.

Text Book:

1. Electronic Instrumentation by H. S. Kalasi Tata McGraw- Hill Publishing Company Limited.

References:

1. A Course in Electrical and Electronics Measurement and Instrumentation by A.K.Sawhney Dhanpat Rai & Co.(Pvt) Ltd.
2. Instrumentation, Measurement and analysis by B.S. N akara and V.S.Mani (TMH)
3. Instrumentation devices and systems by C S Rangan, G R SarmaV S V Mani (TMH)
4. Transducers and instrumentation by D.V.S. Murty, PHI, Ltd. New Delhi.
5. Integrated Circuits by K R Botkar, Khanna Publishers.

Skill Enhance Course –IV(A): Digital Logic Design (DLD)

Credits: 02 **Periods: 45** **Max. marks: 50**

Learning Objectives:

1. To know fundamentals of Digital Logic Design.
2. To study designing of a given combinational logic circuit.
3. To study designing of a given sequential logic circuit.
4. To get fundamental knowledge of PLDs.

Unit-I: **Combinational and Sequential Logic Design** **(18 Lectures)**

Combinational Logic Design:

Overview of Logic Gates and Boolean Algebra, Forms of logic representation: SOP form, POS form, Truth table, Minterm form, Maxterm form, Logic diagram and their inter-conversions, Methods Logic Implementation: AOI, NAND, and NOR and their inter-conversions, Techniques of Minimization of Logic Expressions: K-Map Technique, Quine-McCluskey method, Exercises of Combinational logic Design.

*Sequential Logic Design***:**

Overview of Flip flops, Counters and Shift registers, Exercises of Sequential logic Design

Unit-II: **Programmable Logic Devices (PLDs)** **(12 Lectures)**

Introduction, Simple PLDs (SPLDs), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Generic Array Logic (GAL), Complex PLDs (CPLDs), Field Programmable Gate Arrays (FPGAs)

Hands-on Exercises: **(15 Lectures)**

1. Conversion of one form of logic into other forms
2. Conversion of AOI implementation into NAND implementation
3. Conversion of AOI implementation into NOR implementation
4. Minimization of a logic expression using K-Map techniques
5. Minimization of a logic expression using Quine-McCluskey method
6. Designing and AOI implementation of at least four combinational logic circuits
7. Designing and implementation of at least four sequential logic circuits

Reference Books:

1. Digital Fundamentals- Floyd & Jain- Pearson- (8/e)
2. Modern Digital Electronics- R P Jain- TMH- (3/e)
3. Digital Electronics with Practical Approach- G N Shinde- Shivani Publications- (1/e)

Skill Enhance Course –IV(B): Embedded System Design

Credits: 02 **Periods: 45** **Max. marks: 50**

Course Pre-requisite: BSc SY Electronics pass.

Course Objectives:

1. To introduce concept of Embedded Systems.
2. To study Arduino Environment.
3. To study Arduino IDE, Arduino board.

Course Outcome:

1. Knowledge of Arduino environment.
2. Understanding of Arduino IDE, board.
3. Interfacing skill for LED, LCD and some sensors.

Unit –I : Introduction to Arduino **(15 periods)**

Overview of Arduino, Arduino Environment, introduction to Arduino IDE, Arduino Board, Arduino libraries.

Unit –II: Arduino Uno **(15 periods)**

Special Functions of Arduino, IDE introduction to Arduino Uno, advantages, pin configuration of Arduino uno, programing with Arduino Uno, Downloading and Installing the Arduino IDE, Running the IDE and Connecting to the Arduino, Breaking down a program.

Hands on Exercises (Practical): **(15 periods)**

1. Program to blink LED with Arduino Uno
2. Program to blink tricolor LED
3. Program to interface LCD and display message on it.
4. Program for Interfacing of LED array to generate different sequences.
5. Interfacing seven segment LED with Arduino
6. Digital Logic design with Arduino.
7. Interfacing the temperature sensor with Arduino.
8. Interfacing of Pressure sensor

Reference Books:

1. Exploring Arduino, Jeremy Blum, John Wiley & Sons Inc
2. Arduino Projects for Dummies, by Brock Craft ,2013
3. Programming Arduino - Next Steps, by Simon Monk , 2016
4. Arduino – Getting Started with Sketches, Simon Monk, 2016
5. Arduino Made Simple by Ashwin Pajankar
6. Arduino-Based Embedded Systems : By Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury.
7. https ://www.arduino.cc/en/Tutorial/HomePage
8. http://spoken-tutorial.org

Paper-XVI: Practicals Based On P- XII and XIV

Credits: 02 **Periods: 45** **Max. marks: 50**

Note:

1. Every student must perform at least Ten experiments
2. Use graphs wherever necessary

List of Experiments:

1. Study of Class–C Amplitude Modulation and Measurement of Efficiency, Percentage
1. Modulation Index
2. Study of Linear Diode Detector and Measurement of Detection Efficiency
3. Study of Frequency Response of Two Stage IF Amplifier
4. Study of Frequency Response of Audio Amplifier.
5. Study of Class B Push–Pull Amplifier using Complimentary Symmetry and Determination of Efficiency
6. Study of RF Mixer using BF 194 Transistor
7. Study of FM Modulation using IC 566
8. Study of FM Demodulator.
9. Study of Pulse Amplitude Modulation
10. Study of Pulse Position Modulation
11. Study of Pulse Width Modulation
12. Study of Pulse Code Modulation
13. Measurement of Numerical Aperture of Optical Fiber
14. Study the Bending Loss of an Optical Fiber
15. Study of the Characteristics of Laser LED
16. Study of Photo-Diode Detector Characteristics (Use Avalanche Photo Diode)
17. Study of Transmission and Reception through Optical Fiber

Paper XVII (A): Practical Based On P-XIII (A) and XV (A)

Credits: 02 **Periods: 45** **Max. marks: 50**

Note:

1. Every student must perform at least Ten experiments.
2. Use graphs wherever necessary.

List of Experiments:

1. Uni-junction Transistor Characteristics
2. UJT relaxation oscillator
3. Firing characteristics of SCR.
4. Half wave gate controlled rectifier using one SCR
5. Firing of single SCR using UJT
6. Firing of two SCRs by a UJT.
7. Phase control circuit using SCR
8. Characteristics of DIAC.
9. Firing characteristics of a TRIAC
10. Illumination control using DIAC and TRIAC
11. Light activated turnoff circuit using LDR and SCR
12. Light activated turn off circuit using DIAC-TRIAC and LDR
13. Inverter using SCR and measurement of frequency, output power.
14. Study of simple Chopper circuit/step-up chopper circuit and measurement of on-time, off-time, output voltage.

Paper XVII (B): Practical Based On P- XIII (B) and XV (B)

Credits: 02 **Periods: 45** **Marks: 50**

Note:

1. Every student must perform at least Five experiments from each group.
2. Use graphs wherever necessary.

List of Experiments: Group A

1) Write, Compile and Run a programs in C to enter any two numbers and performs arithmetic operations (+, -, *, /).
2) Write Compile and Run a program in C to find Resistance of a circuit when two resistance are connected in a) series and b) parallel.
3) Write, Compile and Run a program in C to determine simple interest using formula:
   S.I. = P * N * R/100 (P – Principal amount, N- No. of months, R- Rate of interest)
4) Write Compile and Run a program in C to find given integer number is odd or even.
5) Write Compile and Run a program in C to find factorial of given number.
6) Write Compile and Run a program in C to find summation of set of numbers.
7) Write Compile and Run a program in C to print Fibonacci series as follows: 0,1,1,2,3,5,8,13,21,34,……(Note: Every number in series is sum of preceding two numbers.)
8) Write Compile and Run a program in C on Standard string Library functions.
9) Write Compile and Run programs in C to print an array in reverse order.
10) Write Compile and Run a program in C to find sum of array element.
11) Write Compile and Run a program in C to find minimum element from array.
12) Write Compile and Run a program in C to find maximum element from array.

List of Experiments: Group B

1) Study of thermistor
2) Study of thermocouple (594/595)
3) Study of characteristics of Resistance temperature detector (RTD: PT-100)
4) Study of Instrumentation Amplifier (TL084/LM324)
5) Measurement using Strain Gauge and Bridge Amplifier
6) Study of ON/OFF Temperature controller (LM34/LM35/AD590)
7) Precision Rectifier using Op-Amp
8) Study of characteristic of photodiode
9) Study of characteristic of phototransistor
10) Study of pressure transducer
11) Study of Photo voltaic cell.
12) Study of Sample and Hold circuit.