# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

DIPLOMA IN INSTRUMENTATION ENGINEERING

**SEMESTER - IV**

| S.No. | Board of Studies | Subject Code | Subject | Period per week | | | Scheme of Examination | | | | | Total Marks | Credit L+(T+P)/ 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Theory | | | Practical | | | |
| | | | | L | T | P | ESE | CT | TA | ESE | TA | | |
| 1 | Electrical Engg. | 234411 (24) | Networks Analysis | 4 | 1 | - | 100 | 20 | 20 | - | - | 140 | 5 |
| 2 | Mechanical | 234412 (37) | Mechanical Engineering | 3 | 1 | - | 100 | 20 | 10 | - | - | 130 | 4 |
| 3 | Instrumentation | 234413 (34) | Instrumentation | 4 | 1 | - | 100 | 20 | 10 | - | - | 130 | 5 |
| 4 | Electronics & Telcomm Engg | 234414 (28) | Microprocessor And Application | 4 | 1 | - | 100 | 20 | 10 | - | - | 130 | 5 |
| 5 | Electronics & Telcomm Engg | 200414 (28) | Power Electronics | 4 | 1 | | 100 | 20 | 20 | | | 140 | 5 |
| 6 | Electrical Engg. | 234421 (24) | Network Analysis, Lab | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |
| 7 | Mechanical Engg. | 234422 (37) | Mechanical Engineering Lab | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |
| 8 | Instrumentation | 234423 (34) | Instrumentation Lab | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |
| 9 | Electronics & Telcomm Engg | 234424 (28) | Microprocessor And Application Lab | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |
| 10 | Electronics & Telcomm Engg | 200423 (28) | Power Electronics Lab | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |
| 11 | Instrumentation | 234426( 34) | Minor Project | - | - | 2 | - | - | - | 20 | 10 | 30 | 1 |
| | | | Total | 19 | 5 | 12 | 500 | 100 | 70 | 270 | 60 | 1000 | 30 |

**Note : Industrial Training one month** will be organized after 4th semester examination and it's evaluation will be done in 5th semester.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

(A) SEMESTER : IV
(B) SUBJECT TITLE : NETWORK ANALYSIS
(C) SUBJECT CODE : 234411 (24)
(D) BRANCH / DISCIPLINE : INSTRUMENTATION ENGINEERING
(E) RATIONALE :

This core subject is intended to enable the student understand the facts, concepts and principles of electrical ad electronics engineering circuits and how to analyse them. Basic concepts will be clear and it will prove beneficial to student for coming semesters.

**F) TEACHING AND EXMINATION SCHEME:**

| **Course Code** | **Periods/Week (In Hours) (Teaching Scheme)** | | | **Scheme of Examination** | | | | | | **Credit L+(T+P) 2** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **L** | **T** | **P** | **Theory** | | | **Practical** | | **Total Marks** | |
| | | | | **ESE** | **CT** | **TA** | **ESE** | **TA** | | |
| 234411 (24) | 4 | 1 | - | 100 | 20 | 20 | - | - | 140 | 5 |
| 234421 (24) | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |

L : Lecture hours : T : Tutorial hours, P : Practical hours
ESE – End of Semester Exam.; CT – Class Test; TA- Teacher's Assessment

**G) DISTRIBUTION OF MARKS AND HOURS:**

| **Sl. No.** | **Chapter No.** | **Chapter Name** | **Hours** | **Marks** |
|---|---|---|---|---|
| **1** | 1 | Network transformation | 20 | 20 |
| 2 | 2 | Resonance | 12 | 20 |
| 3 | 3 | Filters | 12 | 20 |
| 4 | 4 | Two port network | 20 | 30 |
| 5 | 5 | Laplace transformation | 16 | 10 |
| | | **Total** | **80** | **100** |

## H) DETAILED COURSE CONTENTS:

**Chapter – 1 : Network transformation**

- Mesh and node circuit analysis
- Principle of duality
- Reduction of a complicated N/W
- Conversion between T and ? section
- Superposition theorem
- Reciprocity theorem
- Thevenin's theorem
- Norton's theorems
- Maximum power transfer theorem

**Chapter – 2 : Resonance**

- Quality factor or Q factor
- Series resonance.
- Bandwidth and selectivity of series resonance circuit
- Parallel resonance or antiresonance.
- Band width and selectivity of the anti resonance circuit

**Chapter – 3 : Filters**

- Decibel and neper :- Defination
- Filter fundamental, pass and stop band
- Constant K low pas filter
- Constant K high pass filter
- Band pass & band elimination filter
- M derived filter
- M derived low pass filter
- Attenuators

**Chapter – 4 : Two port network**

- Short circuit admittance parameters.
- Open circuit impedence parameter
- Z parameters, Y parameter's
- Transmission parameter
- Inverse transmission parameter
- Hybrid parameter
- Condition for reciprocity of two port network
  T section representation of a two port network
- Pai section representation of a two part network
- Image impedence
- Symmatrical network
- Ladder network
- Bridge T para T and lattice network

**Chapter – 6 : Laplace transformation**

- Intial condition in elements
- A procedure for evaluating initial condition
- The laplace transformation
- Laplace transform of elementary function
- Application of laplace transform for transient and steady state behaviour of RL, RC and RLC circuits.
- Introducing ideas about N/W synthesis.

## I) SUGGESTED INSTRUCTIONAL STRATEGIES:

It should include good methods like lecture, question answer, assignment and lab work. Drill and practice numerical home & classroom assignments would prove more useful to develop the analytical skills.

## J) SUGGESTED LEARNING RESOURCES.

### (a) Reference Books :

| Sl. No. | Title | Author, Publisher, Edition & Year |
|---|---|---|
| 1 | Networks lines and fields | John D. Ryder |
| 2 | Network analysis | G.K. Mithal |
| 3 | Network analysis | M.E. Van Valkenburg |
| 4 | Network analysis | V.K. Atre |
| 5 | Network analysis | Sanjeev Gupta |

### (b) Others:

- VCDs.
- Learning Packages.
- Lab Manuals.
- Charts.

**Course: Network Analysis, Lab** **CODE : 234421 (24)**

**Hours: 32**

**LIST OF PRACTICALS / TUTORIALS:**

1. Test a 2000 mfd condenser with the help of a multimeter and to comment on the movement of the pointer.
2. Apply the kirchoffslaw for finding current in a complex electrical circuit.
3. Apply the thevening theorem for finding current in a complex electrical circuit.
4. Verify the Norton's theorem.
5. Verify the theorems
   - Super position theorems
   - Maximum power transfer theorem force circuits
6. Observe the wave shape of anintegrating ckt on the CRO.
7. Observe the wave shape of a differentiating ckt.
8. Use the filter circuit in musical light system.
9. Develop a ckt for simple project based on N/W analysis.
10. Measurement of capacitance of a condenser without using R.L.C. bridge.
11. Function of
    - Low pass filter
    - High pass filter
    - Band pass filter
12. Find different electrical parameter in R.L.:R.C.:R.L.C. series circuits and draw the phasor diagram and
    - Determine current and P.F. in each case
    - Determine and observe the resonance condition.
13. Find different electrical parameter in R-C & R-L-C parallel circuit and draw the phasor diagram.
    - Find power and P.F. of the circuit
    - Observe parallel resonance condition

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

(A) SEMESTER : IV
(B) SUBJECT : MECHANICAL ENGINEERING
(C) CODE : 234412 (37)
(D) BRANCH / DISCIPLINE : INSTRUMENTATION ENGINEERING
(E) RATIONALE:
(F) TEACHING & EXAMINATION SCHEME

| Subject Code | Period per week | | | Scheme of Examination | | | | | Total Marks | Credit L+(T+P) 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | | | Practical | | | |
| | L | T | P | ESE | CT | TA | ESE | TA | | |
| 234412 (37) | 3 | 1 | - | 100 | 20 | 10 | - | - | 130 | 4 |
| 234422 (37) | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |

SCHEME OF STUDY ( HRS. DISTRIBUTION )

| S. No. | Topic | Hours | Marks |
|---|---|---|---|
| 1 | PROPERTIES AND TESTING OF MATERIALS | 05 | 10 |
| 2 | HEAT TREATMENT | 05 | 10 |
| 3 | MATERIALS | 06 | 10 |
| 4 | COPPER ALLOYS | 06 | 10 |
| 5 | POWER METALLURGY | 06 | 10 |
| 6 | HYDROSTATICS | 06 | 10 |
| 7 | FLUID MECHANICS AND MACHINERY | 06 | 10 |
| 8 | PROPERTIES OF GASES AND VAPOURS | 06 | 10 |
| 9 | STEAM POWER PLANTS (BOILERS AND AUXILIARIES) | 08 | 10 |
| 10 | IDEAL HEAT ENGINE CYCLE | 08 | 10 |
| | Total | 64 | 100 |

1. PROPERTIES AND TESTING OF MATERIALS

- Mechanical Properties of material
  - Elasticity
  - Plasticity
  - Ductility
  - Toughness
  - Brittleness
  - Hardness
  - Malleability

Formability
Weldability
Tensile Strength
Fatigue etc.

- Their Effects On Service And Manufacturing Process Requirement.
- Material Testing
  Destructive Testing
  Tensile Testing
  Yield Point
  Ultimate Tensile Strength
  Safe Working Stress Factor
  Safety Stress- Strain Diagram
  Hardness Test
- Brinell Hardness Test
  Principle and Procedure
- Impact Testing M/C
  Working Principle for Impact Testing
- Concept of Non Destructive Testing
  Izod And Charpy Test Procedure

2. HEAT TREATMENT

- Definition Objective,
- Type Of Heat Treatment
  Annealing
  Normalizing
  Hardening
  Tempering
- Description , Selection Of A Process Their Limitation.

3. MATERIALS

- Ferrous And Nonferrous Materials ,
- Classification Of Plain Carbon Steel & Alloy Steel.
- Classification Of Cast Iron .
- Alloying Element And Their Effects On Properties Of Steel Composition & Use Of Nickel Steel ,
- Ni-Cr Steel , Stainless Steel , Silicon Steel & Vanadium Steel.

4. COPPER ALLOYS

- Brasses And Bronze,
- Properties Uses Composition Like Cartridge Brass,Silicon Brass, Spring Bronze, Gun Metal, Alumunium Bronze, Electrical Contact Bronze.Properties Of Alumunium And Its Alloys,
- Properties And Uses Of Zinc, Tin, And Plastics.
- Type And Functions Of Lubricants, Selection Of Lubricants,

5. POWER METALLURGY

- Introduction
- Application
- Limitations
- Welding Proceses
- Principle And Uses Of Soldering Process-Purpose
- Application
- Limitations

6. HYDROSTATICS

- Physical Properties Of Fluid
- Pascal`S Law
- Centre Of Presure
- Calculation Of Total Force,Centre Of Pressure For Rectangular Plate

7. FLUID MECHANICS AND MACHINERY

- Continuity Eqn. Of Flow
- Bernaulli's Theorem
- Venturi Meter And Its Use
- Flow Through Pipes
- Friction In Pipes
- Pump Types-Centrifugal And Reciprocating, Their Relative Advantages, Performance, Prime Movers
- Working Principle And Types Of Water Turbines , Selection Of Turbines

8. PROPERTIES OF GASES AND VAPOURS

- Various Terms Related With Gases Like Enthalpy, Specific Heat, Internal Energy
- Boyle`S Law
- Charle`S Law
- First And Second Law Of Thermo Dynamics
- Entropy
- Isothermal
- Adiabatic Process
- Introduction To Various Thermodynamic Process
- Working During Expansion
- Properties Of Steam
- Use Of Steam Tables

9. STEAM POWER PLANTS
( BOILERS AND AUXILIARIES )

- Basic steam power cycles
- Classification of boilers and their working
- Boiler mounting and accessories
- Introduction of modem high pressure boilers

10. IDEAL HEAT ENGINE CYCLE

- Cycle Thermal Efficiency
- Indicator Diagram
- BHP - IHP
- Carnout`S Cycle
- Otto Cycle
- Diesel Cycle
- And Their Efficiencies

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**Course: Mechanical Engineering, Lab** **CODE : 234422 (37)**

**Hours: 32**

LIST OF PRACTICALS:

1. Perform Tensile Test On Standard Mild Steel Specimen
2. Perform Hardness Test Of Standard Mild Steel Specimen
3. Perform Impact Test Standard Mild Steel Specimen
4. Verification of Bernoulli's Equation
5. Determine The Coefficient Of Discharge Of Venturimeter
6. Preparation of enthalpy-entropy chart for a boiler

SUGGESTED INSTRUCTIONAL STRATEGIES

- It should include good methods like lecture, question answer, assignment and lab work. Drill and practice numerical home & classroom assignments would prove more useful to develop the analytical skills.

SUGGESTED LEARNING RESOURCES.

(a) REFERENCE BOOKS

| Sl. No. | Title | Author, Publisher, Edition & Year |
|---|---|---|
| 1 | Material Science | O. P. Khanna<br>Khanna Publisher |
| 2 | Fluid Mechanics | R. K. Bansal |
| 3 | Thermal Engineering | R. S. Khurmi |
| 4 | Hydraulic Machinery | R. S. Khurmi |
| 5 | Applied Mechanics | R. S. Khurmi |

(b) OTHERS:
VCDs.
Learning Packages.
Lab Manuals.
Charts.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

(A) SEMESTER : IV
(B) SUBJECT TITLE : INSTRUMENTATION
(C) SUBJECT CODE : 234413 (34)
(D) BRANCH / DISCIPLINE : INSTRUMENTATION ENGINEERING
(E) RATIONALE:

The emphasis on the syllabus of this course has been given to make the student understand the basic requirement of the various instruments on the shop-floor in an industry, depending upon the nature & product of the industry. It is also foreseen that the students must have in-depth knowledge of the various features of the instrumentation and the process control components & their relationship towards the production line and the quality assurance of the product. Component Coverage is also given to various types of instrumentation parameters and control values & their applications, knowledge of specification.

(F) TEACHING & EXAMINATION SCHEME

| Sub Code | Period per week | | | Scheme of Examination | | | | | Total Marks | Credit L+[(T+P)/2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | | | Practical | | | |
| | L | T | P | ESE | CT | TA | ESE | TA | | |
| 234413 (34) | 4 | 1 | - | 100 | 20 | 10 | - | - | 130 | 5 |
| 234423 (34) | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |

DISTRIBUTION OF HOURS AND MARKS

| S. No. | Topic | Hours | Marks |
|---|---|---|---|
| 1 | Basic Principle of Measurement | 05 | 20 |
| 2 | Transducers | 10 | 10 |
| 3 | Signal Conditioner | 15 | 13 |
| 4 | Indicators & Recorders | 12 | 12 |
| 5 | Oscilloscope | 06 | 10 |
| 6 | Signal Analysis | 18 | 15 |
| 7 | Frequency Counter Time Interval Measurement | 06 | 10 |
| 8 | Active Filter | 08 | 10 |
| | **Total** | **80** | **100** |

**Course Contents:**

1. BASIC PRINCIPLE OF MEASUREMENT

- ?? Elements of Measuring System
  - Accuracy
  - Precision
  - Sensitivity
  - Resolution
- ?? Errors
  - Static Errors
  - Dynamic Errors
  - Significant Figures
- ?? Units
  - Fundamental Units
  - Derived Units.

2. TRANSDUCERS

- ?? Need of Transducers
- ?? Classification of Transducers
- ?? Selecting a Transducer
- ?? Strain Gauges
- ?? Resistance Thermometer
- ?? Thermister ( PTC, NTC )
- ?? Thermo-couple
- ?? Capacitive & Inductive Transducer
- ?? LVDT
  - Piezo-Electric
  - Photo-Electric
- ?? Oscillation,
  - Potentiometeric & Velocity Transducer.

3. SIGNAL CONDITIONER

- ?? Need & Purpose of Signal Conditioning in Instrumentation
- ?? AC & DC Amplifier
- ?? Chopper
- ?? Voltage Controlled Oscillator ( VCO )
- ?? Modulator ( AM, FM, PM) & Demodulator
- ?? Function Generator
- ?? A/D & D/A Converters
- ?? Frequency Divider

4. INDICATIORS & RECORCLERS

- ?? End Devices
- ?? Mode of Display
  - Seven Segment
  - Light Emitting Diode ( LED )
  - Liquid Crystal Diode ( LCD ) / TFT
  - Nixie Tube
- ?? Recorders
  - Chart & Strip Recorders
  - Punch Cards
  - Punched Tapes

5. OSCILLOSCOPE

- ?? Block Diagram Of CRO
- ?? Working Principle
- ?? Delay Line
- ?? Types
  - Lumped Parameter
  - Distributive Parameters
- ?? Oscilloscope Probes
  - High-Voltage Probe ( 10:1 Alternative Probes )
  - Current Probe
- ?? Storage & Sampling CRO
- ?? Digital Storage Oscilloscope ( DSO )

6. SIGNAL ANALYSIS

- ?? Wave Analyzer
  - Frequency Selective
  - Heterodyne Wave Analyzer
- ?? Harmonic Distortion Analyzer
  - Tuned Circuit Harmonic Analyzer
  - Heterodyne Harmonic Analyzer
  - Wave Meter
  - Fundamental Suppression Harmonic Analyzer
  - Spectrum Analyzer
- ?? Applications Wave & Harmonic Analyzer

7. FREQUENCY COUNTER TIME INTERVAL MEASUREM ENT

- ?? Simple Freq. Counters
  Period Measurement.

8. ACTIVE FILTER

- ?? An introduction to Active Filters
- ?? Chebyshev Filters
- ?? Butterworth Filters
- ?? Sallen Key Filters

## Course: Instrumentation, Lab

**CODE :** 234423 (34)
**Hours: 32**

LIST OF PRACTICALS

1. Study of various Controls of a CRO
2. Measurement of Frequency & Phase using CRO.
3. Study of various types of transducers
4. Working of A / D Converters.
5. Working of D / A Converters
6. Study of various types of display devices like LED, LCD etc.
7. Study of various types of signal Processing & system.

SUGGESTED INSTRUCTIONAL STRATEGIES

- ✍ It should include good methods like lecture, question answer, assignment and lab work. Drill and practice numerical home & classroom assignments would prove more useful to develop the analytical skills.

SUGGESTED LEARNING RESOURCES.

(a) REFERENCE BOOKS :

| Sl. No. | Title | Author, Publisher, Edition & Year |
|---|---|---|
| 1 | Electrical & Electronic Measurements & Instrumentation | A K. Sawhney<br>Dhanpat Rai & Sons Publication |
| 2 | Modern Electronic Instrumentation and Measurement Technique | Elbert D Helfrick & W D Cooper<br>PHI Publication |
| 3 | Handbook of Analytical Instruments | R S Khandpur |
| 4 | Instrumentation | E B Jones |
| 5 | Handbook of Applied Instruments | Considine & Ross |

(b) OTHERS:
VCDs.
Learning Packages.
Lab Manuals.
Charts.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

(A) SEMESTER : FOURTH ( IV-Semester )
(B) SUBJECT TITLE : MICROPROCESSOR & APPLICATION
(C) CODE : 234414 (28)
(D) BRANCH / DISCIPLINE : INSTRUMENTATION ENGINEERING
(E) RATIONALE

This course is intended to help the students to understand principle of working of microprocessor & their applications including programming, interfacing and various peripherals used. Students can use the knowledge and skills gained to apply them in new related situations.

(F) TEACHING & EXAMINATION SCHEME

| Subject Code | Period per week | | | Scheme of Examination | | | | | Total Marks | Credit L+ (T+P) 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | | | Practical | | | |
| | L | T | P | ESE | CT | TA | ESE | TA | | |
| 234414 (28) | 4 | 1 | - | 100 | 20 | 10 | - | - | 130 | 5 |
| 234424 (28) | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |

**DISTRIBUTION OF HOURS AND MARKS:**

| S. No. | Topic | Hours | Marks |
|---|---|---|---|
| 1 | Introduction to microprocessor | 6 | 10 |
| 2 | Microprocessor 8085 | 10 | 15 |
| 3 | Instruction set & programming 8085 | 17 | 25 |
| 4 | Stack, sub routine & interrupts | 8 | 15 |
| 5 | Interfacing peripherals | 17 | 25 |
| 6 | Microprocessor based systems | 6 | 10 |
| | Total | **80** | **100** |

**COURSE CONTENTS:**

1 INTRODUCTIONS TO MICROPROCESSOR

✍ Hardware Concepts
- Block diagram of Micro Computer System
- Input, Output devices
- Memory
- Mapping techniques.

✍ Software Concept
- Data, Instruction

- Program Concepts
- Assemblers
- Interpreter
- Compilers.

## 2 MICROPROCESSOR – 8085

✍ Architecture of 8085
- Address Bus,
- Data bus
- Control bus
- ALU
- Registers
- control logic, etc.

✍ Operation
- Microprocessor initiated
- Internal data
- Memory read/write
- Memory I/0 Read/Write.

✍ Timing Cycle
- T-States
- Machine Cycle
- Fetch Cycle
- Execute Cycle
- Read cycle
- Write cycle.

## 3 INSTRUCTION SET & PROGRAMMING 8085 MICROPROCESSOR

✍ Instruction Set
- Data transfer instruction
- Arithmetic & logic operation instruction
- Branching & Looping operation instruction
- Additional data transfer
- 16 bit arithmetic instruction

✍ Programming
- Writing assembly language programs & debugging
- Counters & time delays programs
- Code conversion
- BCD arithmetic
- 16 bit data operation programs.

## 4 STACK, SUBROUTINES & INTERRUPTS.

✍ Stack & Subroutines
- Concept of stack & Subroutines

- Call & return instructions
- Assembly language programs

✍ Interrupts
- Types of interrupts - Hardware & software interrupts
- Mask able & Non mask able Interrupts
- Vectored & Non Vectored interrupts
- Polling.

## 5 INTERFACING PERIPHERALS

✍ Parallel I/O & Interfacing Applications
- I/O interfacing
- Parallel I/O
- I/O instructions
- Memory Mapping
- Memory mapped I/O

✍ Interfacing D/A & A/D Converters.
✍ Programmable Peripheral Interface chip 8255
✍ DMA controller chip 8279
- Functional block diagram
- Internal block diagram and functions in details

?? Brief Concept of 8155
?? Brief Concept of 8253.

## 6 MICROPROCESSOR BASED SYSTEM

✍ Microprocessor Based Stepper Motor Control
✍ Temperature Controllers

## Course: Microprocessor And Application, Lab

**CODE : 234424 (28)**
**Hours: 32**

LIST OF PRACTICALS / TUTORIALS:

Assembly Language Programming

1. Addition of two 8-bit numbers (sum-8-bits)
2. Addition of two 8-bit numbers (sum-8-bits)
3. Addition of two 16- bit nos.
4. Subtraction of two 8- bit nos.
5. Subtraction of two 16 – bit nos.
6. Multiplication of two 8- bit nos. using repeated Addition.
7. Division of two 8- bit nos.
8. To find 1's & 2's complement of a 8 – bit & a 16 –bit number
9. To find Larger No of two 8 bit Numbers
10. To find largest smallest no. from an array
11. To transfer Block of data byler from one memory location to another in same order & in reverse order.
12. To Arrange data bytes in ascending / descending order.
13. To find the sum of positive nos. from an array & store the result at some memory location (Ignore negative nos)
14. Inter facing of IC 8255.
15. Microprocessor based stepper Motor control.
16. Microprocessor based Temperature control.

SUGGESTED INSTRUCTIONAL STRATEGIES:

- ✍ Lecture session with question and answer. Use of microprocessor based interfacing kits. Moreover when teaching this course, drill and practice on programming exercises have to given as classroom and home assignment.

SUGGESTED LEARNING RESOURCES.

(b) REFERENCE BOOKS :

| **Sl. No.** | **Title** | **Author, Publisher, Edition & Year** |
|---|---|---|
| 1 | Microprocessor Architecture Programming & Application. | Ramesh S. Gaondar, Willey-Eastern Pub |
| 2 | Introduction To Microprocessor | Aditya P. Mathur, Tata-Mc Graw Hills Pub |
| 3 | Introduction to Microprocessor: Software, Hardware Programming | Lance A. Laventhall, Prentice-Hall Pub. |
| 4 | Microprocessor and Digital Systems | Douglus V. Hall, Mc. Graw Hill Pub |
| 5 | Microprocessors & Interfacing | Dougus V. Hall Mc. Graw Hill Pub |
| 6 | Microprocessors & Fundamentals | B. Ram, Dhanpat Rai & Sons Pub |
| 7 | Introduction to Microprocessor | Vibhuti |
| 8 | Microprocessor & Microcontroller | B. Ram. |

(b) OTHERS:

VCDs.
Learning Packages.
Lab Manuals.
Charts.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

(A) SEMESTER : FOURTH ( IV-Semester )
(B) SUBJECT TITLE : Power Electronics
(C) SUBJECT CODE : 200414 (28)
(D) BRANCH / DISCIPLINE : INSTRUMENTATION ENGINEERING
(E) RATIONALE :

Power electronics is a subject that concerns the applications of electronic principles in to situation that are rated at power level rather than signal level. Many semiconductor devices such as SCR, DIAC, TRIAC, MOSFET and transistors are available for power applications. An effort is made in this course to provide understanding of the various power electronics applications to enable the students to acquire some core skills related to power electronics.

## F) TEACHING AND EXMINATION SCHEME:

| Course Code | Periods/Week (In Hours) (Teaching Scheme) | | | Scheme of Examination | | | | | | Credit L+(T+P) 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | L | T | P | Theory | | | Practical | | Total Marks | |
| | | | | ESE | CT | TA | ESE | TA | | |
| 200414 (28) | 4 | 1 | - | 100 | 20 | 20 | - | - | 140 | 5 |
| 200423 (28) | - | - | 2 | - | - | - | 50 | 10 | 60 | 1 |

L : Lecture hours : T : Tutorial hours, P : Practical hours
ESE – End of Semester Exam; CT – Class Test; TA- Teacher's Assessment

## G) DISTRIBUTION OF MARKS AND HOURS:

| Sl. No. | Chapter No. | Chapter Name | Hours | Marks |
|---|---|---|---|---|
| 1 | 1 | Power electronics devices | 15 | 20 |
| 2 | 2 | Phase Controlled Rectifier | 12 | 16 |
| 3 | 3 | Commutation Techniques | 12 | 15 |
| 4 | 4 | Chopper | 10 | 12 |
| 5 | 5 | Invertors and UPS | 12 | 15 |
| 6 | 6 | AC voltage controller | 09 | 10 |
| 7 | 7 | Cycloconverter | 10 | 12 |
| | | **Total** | **80** | **100** |

## H) DETAILED COURSE CONTENTS:

**Chapter – 1 : Power electronics devices**

- Introduction to thyristor family
- Use of data book
- Construction, working principle, symbol, characteristics and applications of SCR, UJT, DIAC, TRIAC, PUT, LASCR, IGBT, GTO
- Triggering methods, turn on- turn off characteristics of SCR, di/dt rating, dv/dt rating, Protection against dv/ dt, over voltage & over current protection, necessity of series and parallel combination & string efficiency of combination, firing circuit,

**Chapter – 2 : Phase Controlled Rectifier**

- Half wave & full wave rectifiers, phase controlled Rectifier with R, RL& RL with free wheeling diode load., 3 phase half wave & full wave rectifier with Resistive load.
- Dual Converter: Introduction, working principle and speed control of DC motor using phase controlled Rectifier.

**Chapter – 3 : Commutation Techniques**

- Types of commutation
- Natural commutation
- Forced commutation
- Series resonance/current commutation
- Voltage commutations
- Auxiliary thyristor for commutation
- External pulse commutation.

**Chapter – 4 : Chopper**

- Concepts of choppers
- Types of chopper circuit (A-type to E-type)
- Jones chopper circuit
- Morgon chopper circuit

**Chapter – 5 : Invertors and UPS**

- Working principle of inverter
- Inverter circuits using transistor and thyristor and their comparisons
- Series inverter using thyristor
- Parallel inverter using thyristor
- Use of pulses width modulation (PWM) circuit
- Concept of UPS
- Block diagram of UPS

**Chapter – 6 : AC voltage controller**

- Types of voltage controller with R and RL load.
- Speed control of AC motor using AC voltage controller.

**Chapter – 7**: **Cycloconverter**

- Operating principle of Cycloconverter
- Types of Cycloconverter
- 1phase to 1 phase Cycloconverter.
- 1phase to 3 phase Cycloconverter

## I) SUGGESTED INSTRUCTIONAL STRATEGIES:

When teaching this course, the actual power electronic devices need to be brought to the class and demonstrated to the students. The OHP could be used to magnify the silhouettes of the various components so that the students develop an appreciation of the actual shape of the various components.

## J) SUGGESTED LEARNING RESOURCES.

### (c) Reference Books:

| Sl. No. | Title | Author, Publisher, Edition & Year |
|---|---|---|
| 1 | Power Electronics | Dubey, G.K., |
| 2 | Power Electronics | Ramamurthy |
| 3 | Power Electronics | Rashid, M.H., Prentice Hall of India, New Delhi, 1990 |
| 4 | Power Electronics | Sen, P.C., Tata McGraw Hill, New Delhi, 1999 |
| 5 | Thyristor Engineering | Berde, M.S. Khanna Pub., New Delhi, 1990 |
| 6 | Power Electronics | Bimbhra, P.S., Khanna Pub., New Delhi, 1996 |
| 7 | Power Electronics | Vithayathil, Joseph, McGraw Hill, New York, 1994 |

### (d) Others:

- VCDs.
- Learning Packages.
- Lab Manuals.
- Charts.

## Course: Power Electronics, Lab

**CODE : 200423 (28)**
**Hours: 32**

**LIST OF PRACTICALS / TUTORIALS:**

1. Performance of thyristor, TRIAC & DIAC
2. Frequency calculation of pulse in UJT relaxation oscillator
3. Applications of TRIAC as AC load control
4. Performance of IGBT & GTO
5. Relaxation oscillator circuit using PUT
6. Design of snubber circuit
7. SCR commutating circuits
8. Chopper circuit using SCR
9. Parallel inverter using two thyristors
10. Study of Cycloconverter circuit using thyristors
11. Time delay relay circuit using UJT and thyristor

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

(A) SEMESTER : IV
(B) SUBJECT TITLE : MINOR PROJECT
(C) SUBJECT CODE : 234426(34)
(D) BRANCH / DISCIPLINE : INSTRUMENTATION ENGINEERING

(E) RATIONALE :

The optimum operation of any industrial organization demands its staff to share the administrative and technical responsibilities efficiently and effectively. The great technological and sociological advances that have occurred in all segments of our society have forced the developments of new management concepts, techniques and tools to cope up with complexity, the systematic and organized approach in every discipline is indispensable in a society which is producing more technically qualified persons, newer materials and complex products and more information than ever before.

Apart from this keeping in view of the importance and necessity, the basic concepts of work study, Maintenance and safety have been included.

(F) TEACHING & EXAMINATION SCHEME

| Subject Code | Period per week | | | Scheme of Examination | | | | | Total Marks | Credit L+(T+P)/2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | | | Practical | | | |
| | L | T | P | ESE | CT | TA | ESE | TA | | |
| 234426(34) | - | - | 2 | - | - | - | 20 | 10 | 30 | 1 |

STRATEGIES TO BE ADAPTED FOR SELECTING WORKING ON PROJECT-WORK

1. Identification of project by interest & choice of the student.
   ( Part of Entrepreneurship )
2. Selection of a Project for desired output.
3. Possibly modification of the selected Circuit / Given Circuit.
4. Fabrication of PCB & Component-Mounting.
5. Procurement of components & Accessories.
6. Testing of the components using various Testing / Measuring Instruments.
7. Working skill of fabrication of the cabinet / Chassis and mounting components & controls displays.
8. Safety & Precaution Measurements.
9. Disposals of Waste & Hazard Materials ( Part of Environment )
10. Testing of Product and Test-Report.
11. Market-Survey for Product-Sales ( Part of Entrepreneurship )
12. Economic viability of Product ( Part of Entrepreneurship )
13. Costing of the project/product
    a. Capital costs
    b. Material & production cost (for entrepreneurship )
14. Documentation of project report
    i. Drafting

ii. Sketching
iii. Layout
iv. Presentation

1. The Design and drafting of Printed Circuite
By- Mr. Darryl Lindsey
2. Printed Circuit Boards Design and technology
By - Walter & Bosshant .