VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

FACULTY OF TECHNOLOGY INCLUDING ENGINEERING
BOARD OF STUDIES IN INSTRUMENTATION & CONTROL ENGINEERING

Proposed Teaching and Examination Scheme and Detailed Syllabus

for

B.E.III (INSTRUMENTATION AND CONTROL ENGINEERING)

1999

Scheme For Teaching and Examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

B.E.-III (Instrumentation & Control)

Semester- V

Course	**Course No**	**Teaching Scheme**			**Examination Scheme**						
		L	T	P	Theory Exam University Exam		Pract/Quiz/Viva/T.W. etc. Hrs	Pract	Int	Tuto	Total
Economics & Business Management	HU 501 EC/ IC	3	0	0	3	100	0	0	0	0	0
Control System Components	IC 502 IC	3	1	2	3	100	3	30	20	25	75
Instrumentation systems	IC 503 IC	3	0	2	3	100	3	30	20	0	50
Microprocessors programming & interfacing.	EC 504 EC/IC	3	0	2	3	100	3	30	20	0	50
Power Electronics	IC 505 IC	3	1	2	3	100	3	30	20	25	75
Linear Integrated Circuits	IC 506 IC	3	0	2	3	100	3	30	20	0	50
		18	2	10		600		150	100	50	300
	(Total)	30						Grand	Total		900

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Semester- V

ECONOMICS & BUSINESS MANAGEMENT : HU 501 EC/IC

	Lecture	Tutorial	Practical
Teaching Hours	3	0	0
Examination Scheme Marks	100	0	Cont. Evaluation 0 Examination 0

1	OPERATIONS RESEARCH: 1. Introduction: Evolution of OR, team approach, quantitative approach, application. 2. Linear Programming: Basic concepts, formulation of models, limitations of LP, LP Methods, Graphical & Simple Method, Degeneracy, multiple optimal solution, unbounded problem, infeasible problem, Transportation problem and transportation models, Assignment problem & assignment method. 3. Decision Theory: Decision making under different situation (certainty, uncertainty, under risk), Decision tree model. 4. Queuing System: Queuing problem, assumptions, *M/M/1 Model. 5. Simulation: Analytical and simulation models, Monte Carlo simulation model and Computer simulation. (* denotes Poisson arrival, Poisson departure, single server, infinite capacity and FIFO service discipline).
2	BUSINESS MANAGEMENT: 1. Introduction: Engineering Management and Organization, Evolution process. 2. Business Organization: Types, individual, proprietorship, partnership, joint stock company, Cooperative and State owned organization. 3. Management: Definitions, concepts and principles, Management process, Functional (Production, Finance, Marketing, and Personnel) Management, Coordination and its importance. 4. Trade Unions and Industrial Relations: Collective bargaining, industrial dispute act and social security measures in India

References:

1. K. V. RAO: Management Science, McGraw Hill Co., New Delhi,Ed.(1990).
2. O. P. KHANNA: Industrial Engg. & Management, Dhanpatrai & Sons, New Delhi,Ed. (1990).
3. R. D. AGRAWAL: Organization & Management, Tata McGraw Hill, New Delhi,Ed. (1993).
4. S. D. SHARMA: Operations Research, Kedarnath Ramnath & Co., Meerut,Ed.(1992).

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CONTROL SYSTEM COMPONENTS: IC 502 IC

	Lecture	Tutorial	Practical
Teaching Hours	3	1	2
Examination Scheme Marks	100	25	Cont. Evaluation 20 Examination 30

1	MECHANICAL COMPONENTS FOR POSITION SERVO CONTROL : **-Cams and followers**: Types of cams , types of follower and application, **-Gears and gear train** :construction and comparison of different types of gears : Spur,bevel,helical,rack and pinion warm gear and hearing born gear. Optimization of gear ratio in gear and backlash,gear train. - **Gyroscope** : construction,operation, types of gyros and it's applications.
2	ELECTRICAL COMPONENTS FOR CONTROL: -**Relay**: A/C, DC electro- mechanical, Solid-state etc. and Its construction and operation with characteristic. -**Stepper motor** : construction, types of motors,design of driver ckt., designing with logic input and applications. - **Potentio Meters** : types : single turn, multi turn wire wound, slide wire etc. functioning of pots. , Application for different modes (Angle transmission, non linear func. generators etc),Balancing, char.,accuracy and resolution - **Synchros**: Introduction theory of synchros operation, Construction, Transmitter & Receiver system configuration, errors residual Voltage & phase shift, Zeroing effect and Applications. -**Tachogenerator**: - Mechanical tachometer : types , centrifugal force, resonance tacho.,. electrical tachometer : eddy current type resonant tacho, electrical generator type, contact less, frequency type, ignition type, stroboscopic type and magnetic pick up type tacho and it's Application .
3	SIGNAL CONVERTING ELEMENTS : -**Amplidyne** : principle of operation, construction, T. F. of amplidyne, steady state and transient char., Applications. **Magnetic Amplifier** : Introduction series connection, magnetic amplifier, time constant, O/p char,.reactor connected in parallel,. gain (power), feedback effect, etc and applications.
4	PNEUMATIC & HYDRAULIC BASED COMPONENTS: -Air based flapper nozzle construction and Pneumatic relay. -hydraulic Based : Pump based Hydraulic system, (vane pump, ball pump & spool, pitot valve type hydraulic system).
5	BRIEF INTRODUCTION ABOUT CNC MACHINE: Operations & Applications

Tutorials/ practical will be based on theory.

References:

(1) PANDYA & SHAH: Theory of machine Vol. I ,Charotar Publications, E(1990).

(2) B. KOREN & BENURI : Numerical control of machine tools, Khanna Publishers, E(1998).

(3) B GIBSON AND TUTOR: Control system components,Tata McGraw hill Publication,

(4) B. CHATERJEE : Control System Components, Khanna Publishers,E(1998).

(5) D. S. KUMAR : Mechanical Measurements and Controls, Metropoliton Book Co.,New Delhi, Ed(1994).

(6) ATHANI V. V. : Stepper Motor Principle and Application,New Age International, Ed(1997).

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Semester- V

INSTRUMENTATION SYSTEMS : IC 503 IC

	Lecture	Tutorial	Practical
Teaching Hours	3	0	2
Examination Scheme Marks	100	0	Cont. Evaluation 20 Examination 30

1	BASICS OF INSTRUMENTATION : -Introduction . -Instrument Symbols and identification, -P & I diagram,loop wiring diagram, special drawings. -Organization of instrumentation dept.
2	CONTROL ROOM AND CONTROL PANELS: -Control room layout and power design, -Types of panels and It's proper application, -Piping tubing taping and wiring of panel.
3	INSTRUMENT AIR SYSTEMS : -Air Supply system : Design, and sizing criateria,compressor systems and Its types, -Dryers -Distribution system.
4	INDICATOR RECORDERS AND ANNOUNCIATORS : -Indicators :Types of Indicators for various applications, -Recorders : Types of recorders and It's merits and demerits, -Annunciators : Function ,sequences displays , types, -Microprocessor for recording, announcing and indicating purpose.
5	SAFETY AND PROTECTIVE DEVICES IN INSTRUMENTATION: -Hazardous area and Classification, -Intrinsic safety, -Pressure, temperature,level and flow switches.
6	UN INTERRUPTED POWER SUPPLY: -ON line and OFF line UPS.
7	GROUNDING: Different types of grounding methods.

Practicals will be based on theory.

References:

(1) D. P. ECKMAN : Industrial Instrumentation,Wiley Eastern Publication,E(1991).
(2) ANDREWS: Applied instrumentation in process industry Vol. II,III ,Gulf Book Co.,P(1994).
(3) LIPTAK : Process instrumentation hand book ,Chilton Book Co.,Pensilvenia,P(1994).
(4) C.D. JOHNSON: Process control instrumentation, PH,USA, Vth Ed. (1996).
(5) R. K. JAIN.: Industrial measurements, Khanna Publishers,Ed(1998).

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Semester- V

MICROPROCESSOR PROGRAMMING & INTERFACING : EC 504 EC/IC

	Lecture	Tutorial	Practical
Teaching Hours	3	0	2
Examination Scheme Marks	100	0	Cont. Evaluation : 20 Examination : 30

1	Microprocessor Architecture: Introduction, operation, memory, input/output and Interfacing Devices
2	Instructions and Timings: Instruction classification, timings and operation status, overview of 8085 instruction set.
3	Programming Methods and Techniques: Assembly language programming using different programming techniques like looping, counting and indexing, subroutines parameter passing, time delay programs.
4	Interrupts:8085 Interrupts, restart as software instruction, Additional I/O concepts
5	Parallel Input /Output and Interfacing Applications: Basic interfacing concepts, 8255 Programmable Peripheral Interface, Interfacing displays, keyboards, 8279 Programmable Keyboard/Display Interface, Interfacing memory, Memory, mapped I/O.
6	General Purpose Programmable Peripheral Devices: 8253 Programmable Timer 8257 DMA controller, 8259 Interrupt controller.

Practical work shall be based upon the theory course.

References:

1. GAONKAR R S: Microprocessor Architecture, Programming and Applications with 8085 , Wiley Eastern Limited, New Delhi, Ed(1998).
2. LEVENTHAL LANCE: Introduction to Microprocessor: Software, Hardware and Programming, PHI,Ed(1992).
3. MATHUR A. P.: Introduction to Microprocessor. Tata McGrawHill ,3/e, 1996
4. SHORT K. L.: Microprocessors and Programmed Logic, PHI, Ed(1992).

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Semester- V

POWER ELECTRONICS : IC 505 IC

	Lecture	Tutorial	Practical
Teaching Hours	3	1	2
Examination Scheme Marks	100	25	Cont. Evaluation 20 Examination 30

1	INTRODUCTION**:** History,scope and application of power electronics.
2	THYRISTORS **:** -Two transistor model of SCR.Turn on and turn off methods for SCR.,Series and parallel operation of SCR. -Thyristor families,SCR, Diac, Triac - construction, V-I characteristics, applications, -Requirement of gate triggering and various firing techniques. - Triac, GTO, diac, Sources of thyristor triggering. -Thyristor types like phase control type,fast switching type, GTO, LASCR,FET and MOS controlled thyristor. -di/dt and dv/dt protection.
3	POWER TRANSISTOR DEVICES: Basic structure and V-I characteristics of power MOSFET, IGBT, SIT, Switching characteristics, Gate/Base drive circuits, Safe operation area, di/dt dv/dt limitation, series/parallel operation, ratings.
4	RECTIFIERS AND CONVERTORS: Uncontrolled rectifier : Single phase central taped transformer connection, half wave and full wave bridge configuration, three phase half and full bridge converters, Concept of flywheeling diode, operation with resistive, inductive and back EMF load, - Controlled rectifiers : Single phase semi-dual- full converters, three phase half wave converter and semi converter,dual and full converter,Power factor improvement, operation of all converters with resistive, inductive and back EMF load, - effect of source inductance on converter performance, power factor, ripple factor calculation.
5	THYRISTOR COMMUTATION TECHNIQUES : - Natural commutation & Force commutation, - Voltage/Current commutation, - DC chopper, Principle of voltage control, analysis of morgan chopper circuit, Johns chopper circuit, regenerative chopper circuit.
6	POWER DEVICES PROTECTION: Protective measure, types of Snubber circuits and their functions, Snubber circuits for transistors and thyristors, thermal protection, design of heat sinks.

Practicals will be based on theory.

References:

1. N. MOHAN : Power Electronics : Converters, Applications and Design. Wiley Publication,Ed(1995).
2. M.H. RASHID: Power Electronics: Circuits, Devices and Applications. PHI, Ed(1994).
3. G.K. DUBEY: Thyristorized Power Controllers. Wiley Eastern, Ed(1990).
4. S. B. DOWAY: Power Semiconductors Circuits. John,WileyPublication,ED(1994).
5. P. C. SEN : Power Electonics,TMH Publication, 1/e, 11th reprint ,1997.
6. P. S. BIMBHRA : Power Electronics, Khanna Publishers, 2/e,1998.

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LINEAR INTEGRATED CIRCUITS : IC 506 IC

	Lecture	Tutorial	Practical
Teaching Hours	3	0	2
Examination Scheme Marks	100	0	Cont. Evaluation 20 Examination 30

1	BASIC OPERATIONAL AMPLIFIER - Differential OP Amplifier model on transistor based and Its characteristics,- IC Based different types of op- Amplifier - Characteristic & Specifications of op amp - Feed back configuration, Parameter Measurement, Frequency Response, effect of temp, i/p impedance, Other parameters etc, Gain (O/L & C/L), Offset nullifying etc
2	APPLICATIONS OF OP AMP : - Negative Feed back. Appn.: ,- As a Adder, Multiplier, Integrator, differentiator, Constant Voltage & Current Source. - Analog simulation for Solving different equations.- Positive feed back. Appn. : - Oscillators, Phase shift, Wein bridge, Hartlay,Colpitt, Crystal etc. - Multivibrators. - Half & Full Rectifier, - Non. linear Appn. - pick detector, - Schmitt trigger, - Comparator, - Sample & Hold Ckt. , - Basic concepts of ADC & DAC on op. amp. etc.
3	BASIC INTRODUCTION OF 555 : Timer IC with working, operation and its application as Multivibrator.
4	POWER REGULATOR IC: 78×× & 79×× Series and Ideas for DC low power Voltage regulators Ckt; negative and variable voltage regulators, too.
5	FILTERS : - Butter worth, Chebychev,Elliptic filters, - Design and evaluation of Second order filters (low pass, high pass, Band pass & Band reject) and Cascading of pt.

Practicals will be based on theory.

References:

(1) JACOB MILLMAN & CHRISTOS C. HALKIAS: Integrated electronics: Analog & digital ckts & systems , Tata McGRAW - HILL Ed.(1991).

(2) RAMAKANT GAYKWAD: Op-Amps and linear integrated circuits. Prentice Hall of India, IIIrd Ed. (1997).

(3) MALVINO A.P :Electronic principles,TATA McGraw Hill pub.co. IIIrd Ed.(1995).

(4) COUGHLIN & DRISCOLL : OP AMP & Linear Integrated ckts. PHI, 5th Ed.(1998).