

**DRAFT SYLLABUS OF DIPLOMA ENGINEERING
(3rd Semester to 6th Semester)**

BRANCH : ELECTRONICS & TELECOMMUNICATION ENGINEERING

Under

TRIPURA UNIVERSITY
(A Central University)
Suryamaninagar

SYLLABI OF DIPLOMA IN ELECTRONICS & TELECOMMUNICATION

ENGINEERING

(Third Semester to Sixth Semester)

THIRD SEMESTER

	Theoretical Paper					Sessional / practical paper			
	1 st half (50mark)	2 nd half (50 mark)	Mark	CPW	Credit	Name of Sessional / practical	Mark	CPW	Credit
	Electronic Devices-I	Circuit Theory							
	DETC/EE-301								
ii	Digital Electronics DETC – 302		100	3	3	Circuit Theory Lab DEE-311S	100	3	2
iii	Network Analysis and Transmission Lines DETC– 303		100	3	3	C Programming Lab DCS-304S	100	4	2
	Electrical Machine	Mathematics- III							
	DEE/HU-304								
v						Network Analysis & Transmission Lines Lab DETC-306S	100	4	2
vi						Electrical Machines Lab. DEE-307S	100	3	2
			400	14	14		600	22	12

FOURTH SEMESTER

	Theoretical Paper					Sessional / practical paper			
	1 st half (50mark)	2 nd half (50 mark)	Mark	CPW	Credit	Name of Sessional / practical	Mark	CPW	Credit
i	Communication Engineering – I DETC -401		100	4	4	Communication Engineering Lab-I DETC- 405S	100	4	2
ii	Microprocessors and Interfacing DETC – 402		100	3	3	Microprocessor and Interfacing Lab DETC-406S	100	4	2
iii	Electronic Devices – II DETC– 403		100	3	3	Electronic Devices Lab-II DETC-407S	100	4	2
	Consumer Electronics	Electronic Measurement							
	DETC-404								
v						Communication Skill Lab HU-400S	100	3	2
vi						Electronic Measurement Lab DETC – 409S	100	4	2
			400	14	14		600	22	12

STUDENTS SHOULD UNDERGO 2 WEEKS INDUSTRY TRAINING AT THE END OF FOURTH SEMESTER (DURING SUMMER VACATION).

FIFTH SEMESTER

	Theoretical Paper					Sessional / practical paper			
	1 st half (50mark)	2 nd half (50 mark)	Mark	CPW	Credit	Name of Sessional / practical	Mark	CPW	Credit
	Industrial Management	Entrepreneurs hip Development							
	DHU -501								
ii	Communication Engineering – II DETC – 501		100	4	4	Industrial Electronics Lab DETC-504S	100	4	2
iii	Industrial Electronics DETC– 502		100	3+1T	3	Industrial Training** DITS-500S	100		2
iv	Computer Architecture and Organization DCS-509		100	3+1T	3	Project - I DETC – 505S	100	4	2
v						Electronic CAD and Matlab™ Basics Lab DETC-506S	100	4	2
vi						PCB Design Lab DETC – 507S	100	4	2
			400	16	14		600	20	12

** Two weeks Industrial Training After 4th Semester (during Summer Vacation)

SIXTH SEMESTER

	Theoretical Paper					Sessional / practical paper			
	1 st half (50mark)	2 nd half (50 mark)	Mark	CPW	Credit	Name of Sessional / practical	Mark	CPW	Credit
	Professional Ethics & Values	Optimisation Technique							
	DHU -601								
	Instrumentat ion	Control Engineering							
	DETC/EE-601								
iii	Elective DETC– 602		100	3	3	Project – II DETC-605S	200	8	2
						Grand Viva#			
						General Skill			
						DETC-606S			
v						Object Oriented Programming Lab DCS-611S	100	3	2
			400	14	14		600	22	12

Elective Subjects: 1) Advanced Microprocessors and Microcontrollers. 2) Fibre Optic Communication. 3) Microwave Engineering. 4) Television Engineering. 5) Computer Network

THIRD SEMESTER

	Theoretical Paper					Sessional / practical paper			
	1 st half (50mark)	2 nd half (50 mark)	Mark	CPW	Credit	Name of Sessional / practical	Mark	CPW	Credit
	Electronic Devices-I	Circuit Theory							
	DETC/EE-301								
ii	Digital Electronics DETC – 302		100	3	3	Circuit Theory Lab DEE-311S	100	3	2
iii	Network Analysis and Transmission Lines DETC– 303		100	3	3	C Programming Lab DCS-304S	100	4	2
	Electrical Machine	Mathematics- III							
	DEE/HU-304								
v						Network Analysis & Transmission Lines Lab DETC-306S	100	4	2
vi						Electrical Machines Lab. DEE-307S	100	3	2
			400	14	14		600	22	12

Detailed Syllabus

THIRD SEMESTER

1. **Electronic Devices & Circuit Theory** Subject Code : **DETC/EE-301**

a. Electronic Devices-I (1st Half) Total Marks : 50, credit :2 , CPW :2

RECTIFIER AND POWER SUPPLY: Half wave and Full wave Rectifiers: Average voltage – rms voltage, efficiency and ripple factor – Percentage voltage regulation. Function of filter circuits – Capacitor input filter – Inductive filter – Π type filter – Calculation of ripple factor and average output voltage – Function of bleeder resistor. Series and shunt regulator using transistor – IC Voltage Regulators: Positive & Negative, their specifications Basic idea of switch mode power supply with block diagram, their advantages over linear power supply.

TRANSISTOR BIASING : Concept of Q-point, ac and dc load lines. Stabilization and stability factor. Biasing : Base bias — Collector feedback bias — Emitter feedback bias — Potential divider bias. Bias compensation circuits using diode and thermistors – Current mirror bias. FET biasing.

SMALL SIGNAL TRANSISTOR AMPLIFIERS: Hybrid model and h-parameters of CB, CE & CC mode transistor amplifiers – Calculation of voltage gain, current gain, power gain, input and output impedance in terms of h-parameters – Comparison of the three

configurations. Small signal FET equivalent circuits – Common source and common drain amplifier – FET application as VVR, constant current source etc. Operation of VMOS & CMOS and power MOSFET – Precautions in handling MOSFET.

References:

- 1) Integrated Electronics, Millman & Halkias : TMH.
- 2) Electronic Devices And Circuits, Salivahanan, Kumar & Vallavaraj: TMH
- 3) Electronic Devices & Circuits, Boylestead & Neshelsky : PHI
- 4) Electronic Circuits , Discrete & Integrated, Schilling & Belove: TMH
- 5) Electronic Fundamentals & Applications, Chattopadhyay & Rakhshit, New Age
- 6) Microelectronic Circuits, Adel S. Sedra & Kenneth C. Smith, OUP.

b. Circuit Theory (2st Half) DETC/EE-301 Total Marks : 50, credit :2 , CPW :2

NETWORKS & A.C. FUNDAMENTALS : Definitions & explanation: Active & passive elements as well as networks – Linear & non-linear networks – Unilateral & bilateral networks. Statement, explanation, limitation & problems on Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star-delta conversion. Single-phase A.C. Circuits: Concept of complex impedance – Rectangular & polar form. R-L-C Series Circuit: Representation of impedance, voltage, current and power in complex form phasor diagram Impedance triangle – problems. Parallel Circuit: Phasor diagram, problems (maximum 3 branches).

RESONANCE & SELECTIVITY: Series Resonance: General aspects – Impedance & phase angle of series resonant circuit – Voltages & current in series resonant circuit – Study of different curves – Quality factor – Selectivity & bandwidth – Voltage magnification – Problems – Acceptor Circuit (concept only). Parallel Resonance: Resonant frequency for a tank circuit study of curves attaining resonance by varying frequency & R_L – Current magnification – Quality Factor – Selectivity & bandwidth – Applications – Problems – Rejector circuit (concept only). Comparison between series & parallel resonance.

TRANSIENTS: Steady State & Transient Response – Initial & Steady-state condition – Time constant DC response of RC circuit – problems. Sinusoidal response of R-L & R-C circuits – problems. Polyphase Circuits: 3 phase system – Phase sequence – Advantages over 1-phase system – Inter connection of 3-phase sources & loads – Relation between line & phase values of voltage & current both in star & delta connections – 3-phase power – Problems on balanced as well as unbalance (3-phase 4-wire) system.

References:

- 1) Network, Filters & Transmission Lines / A. Chakraborti / Dhanpat Rai Pub. Co.

- 2) Basic Electrical Engineering / Nagrath & Kothari / Tata McGraw-Hill
- 3) Basic Electrical Engineering / J.B. Gupta / S. Kataria & Sons
- 4) Electric Circuit Analysis / S.N.Sivanandam / Vikas
- 5) A Text Book of Electrical Technology Part-I / B.L. Thereja / S. Chand Pub. Co
- 6) Fundamentals of Electrical Networks / B.R. Gupta / Wheeler
- 7) Circuits & Networks / Sudhakar & Shyammohan / Tata McGraw-Hill
- 8) Schaum's Series of Circuit Theory / Tata McGraw-Hill

2. Digital Electronics

Subject Code : **DETC -302**

Total Marks : 100, credit :3 , CPW :3+1T

GROUP –A

(1ST HALF)

BASIC LOGIC GATES : Symbolic representation and truth table for logic gates:
BUFFER – NOT – OR – AND – NAND – NOR – XOR – X-NOR

BOOLEAN ALGEBRA: Boolean variables – Boolean function – Rules and laws of Boolean algebra – De Morgan's theorem, Max. term and min. term – Canonical form of equation – Simplification of Boolean expression. Karnaugh map technique – Don't care condition – Prime implicants – Canonical forms – Quine-McClusky method. Realization of Boolean expression with logic gates.

COMBINATIONAL LOGIC CIRCUITS: Arithmetic circuits: Half adder – Full adder – Half subtractor – Full subtractor – Parallel and serial full adder (1's complement, 2's complement and 9's complement addition). Design of circuits using universal gates. Code converter, encoder and decoder – Multiplexer & demultiplexer. Parity generator and checker – Magnitude Comparator.

SEQUENTIAL LOGIC CIRCUITS: Difference between combinational and sequential logic circuits – Triggering of sequential logic circuits. Difference between flip flop and latch – Construction of RS, D, JK, JK master slave, T flip flops using basic gates, preset and clear signal. Counters: Asynchronous and synchronous counter – Ripple counter – Mod-N counter – Up-down counter – Ring counter – Johnson counter – Programmable counter – Applications. Registers: Shift registers – Serial in serial out – Serial in parallel out – Parallel in serial out – Parallel in parallel out – Applications.

Group – B

(2nd half)

MEMORY DEVICES: Memory Addressing: Read, Write and Read Only operations. Memory Cells: ROM, PROM, EEROM, EPROM, CDROM. Static and dynamic RAM – Refreshing of dynamic RAM. Volatile and non-volatile memories, PLDs: PLA, PAL, GAL, CPLD, FPGA.

DATA CONVERTERS: Digital to Analog Converters: Binary weighted resistor type – R-2R ladder type – Specifications and applications of DA converter. Analog to Digital Converter: Comparator type – Successive approximation type – Dual slope AD converter – Specifications and applications of AD converter.

LOGIC FAMILIES: Comparative studies of different type of logic families like DTL, TTL, CMOS, and ECL etc. with the following characteristics: (a) logic levels, (b) power dissipation, (c) fan in and fan out, (d) propagation delay, and, (e) noise immunity.

References:

- 1) Digital Principles and Applications, Malvino & Leach: TMH.
- 2) Digital Logic Design, M. Morris Mano, PHI
- 3) Modern Digital Design, R.P. Jain, TMH.
- 4) Digital Circuits and Design, S. Salivahanan & S. Arivazhagan, Vikas Publishing.
- 5) Digital Circuits: An Introduction Part -1 & 2, D. Roychaudhuri, Eureka Publisher.
- 6) Digital Systems, Principles and Applications, Ronald J Tocci , PHI
- 7) Digital Integrated Electronics, Taub & Schilling, TMH
- 8) Digital Technology, Virendra Kumar, New Age.

3. Network Analysis and Transmission Lines Subject Code : **DETC -303**
Total Marks : 100, credit :3 , CPW :3

NETWORK FUNDAMENTALS: Active and passive network – Balanced and unbalanced network – Symmetrical and asymmetrical network – T and Π network and their conversion – Simple problems. Characteristic impedance – Propagation constant and image impedance – Open and short circuit impedance and their relation to characteristic impedance.

FILTER CIRCUITS: Definition and relationship between neper and decibel. Basic idea of passive filter – Definitions of pass band, stop band and cut-off frequency. Constant-K prototype Filters: a) Low pass filter, b) High pass filter, c) Band pass filter, and, d) Band stop filter. Active Filters: Basic idea – Their advantages and disadvantages over passive filters – Applications of filter circuits, M-Derived Low-Pass and High-Pass Filters.

ATTENUATOR & EQUALISER: Basic idea of attenuator – Difference between attenuator and filter – Symmetrical T and Π attenuator – Field of application of attenuators. Concept of equalizer – Purpose of equalizer and its classification – Difference between series & shunt equalizer and their field of applications

TRANSMISSION LINES: Types of transmission lines: Parallel wire and coaxial cable, Primary and secondary constants of transmission lines. Characteristic impedance – Reflection co-efficient – Standing wave ratio and their relationship. Simple matching methods, single and double stub match for transmission lines. Losses in transmission lines. Distortion in transmission line – Causes of distortion and condition for distortionless transmission – Practical feasibility for distortionless transmission.

TRANSIENT RESPONSE IN ELECTRICAL NETWORK: Laplace Transform: Definition – Condition of existence - Transforms of some elementary functions – Linearity property – First shifting property – Change of scale property – Inverse Laplace Transform. Transient response in electrical networks with sinusoidal and step function – Analysis with RL, RC, RLC circuits, time constant.

References:

- 1) Network, Filters and Transmission Lines / Jain & Kaur / Tata McGraw-Hill

- 2) Circuit and networks / Sudhakar / Tata McGraw-Hill
- 3) Introduction to network, Filters and Transmission Lines / A. K. Chakraborty / Dhanpat Rai & Sons
- 4) Network Analysis / V. Valkenburg / Prentice Hall of India, N. Delhi
- 5) Engineering Circuit Analysis / Hayt / Tata McGraw-Hill
- 6) Electric Circuits / Edminister / Tata McGraw-Hill
- 7) Network, Lines and Fields / Ryder / Prentice Hall of India, N. Delhi

4. **Electrical Machine & Mathematics-III**

Subject Code : **DEE/HU-304**

a. Electrical Machine (1st Half) Total Marks : 50, credit :2 , CPW :2

SINGLE-PHASE TRANSFORMER: Construction and basic principle of operation, Core type and shell type. Materials used for core. Winding and insulation,(E.M.F. equivalent circuit;) Equivalent circuit referred to primary -- phasor diagram, Polarity test, O.C and S.C. test Regulation. Efficiency. All day efficiency, Parallel operation.

INDUCTION MOTOR: Three phase balanced excitation system. Development of rotating magnetic field. Frequency of the induced emf and relationship to number of poles. Construction and basic principle of operation of 3 phase induction motor, Slip, Slip speed and slip frequency, Per-phase equivalent circuit, Phasor diagram, Types of windings, Squirrel cage and slip-ring motor construction, Equations for torque, Torque-speed characteristics, Effect of change in rotor resistance in slip-ring machine, Methods of starting and speed control.

D.C. MACHINES: Construction and operating principle, Function of commutator and brush system, Armature reaction and their effects, MMF distribution, Commutation, Interlopes. **D.C. GENERATORS:** EMF equation characteristics with different excitation systems, Voltage relation. Parallel operation. **D.C. MOTORS:** Equation for torque, characteristics with different excitation systems, method of starting. Speed control, Speed-torque characteristics.

References:

- 1) Electrical Machines by S. K. Bhattacharya – TMH
- 2) Electrical Machines by M. Deshpande – Wheeler
- 3) Theory and Performance of Electrical Machines by J. B. Gupta – Kataria
- 4) Electrical Machine by Dr. P. K Mukherjee & S. Chakraborty
- 5) Text book of Electrical Technology – Vol-II by B. L. Thereja – S. Chand
- 6) Induction & Synchronous machines by K. Murgeshk Kumar – Vikas
- 7) Performance & Design of D. C. Machines by M.G. Say

b. Mathematics-III (2nd Half) Total Marks : 50, credit :2 , CPW :2

FOURIER SERIES AND FOURIER INTEGRALS: Periodic functions, Euler formulae for Fourier coefficients, functions having arbitrary period, even and odd functions, half range expansions, Fourier integral, Fourier cosine and sine transformations, linearity

property, transform of derivatives, convolution theorem (no proof) Gamma and Beta functions, error functions - definitions and simple properties.

PARTIAL DIFFERENTIAL EQUATIONS: Solutions of equations of the form $F(p, q) = 0$, $F(x, p, q) = 0$, $F(y, p, q) = 0$, $F(z, p, q) = 0$, $F_1(x, p) = F_2(y, q)$, Lagrange's form $Pp + Qq = R$. Vibrating string : one dimensional wave equation, D'Alembert's solution, solution by the method of separation of variables. One dimensional heat equation, solution of the equation by the method of separation of variables, solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variables.

PROBABILITY AND STATISTICS: Probability distributions: random variables (discrete & continuous), probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution, normal distribution.

References:

- 1) Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
- 2) Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.
- 3) Numerical Solutions of Differential Equations by NK Jain ; Prentice Hall, Delhi.
- 4) Potter, Goldberg : Mathematical Methods, Prentice - Hall
- 5) Churchill R.V.: Fourier series and Boundary Value Problems - McGraw Hill
- 6) Irvin Miller & Freind : Probability and statistics for Engineers , Prentice Hall of India.
- 7) Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill 2003.
- 8) Engineering Mathematics-I Rukmangadhachary, Pearson Education.

5. **Electronic Devices Lab-I** Subject Code : **DETC-304S**
Total Marks : 50, credit :2 , CPW :4

Laboratory experiments based on syllabus of **DETC/EE-301** (1st Half)

6. **Circuit Theory Lab**
Total Marks : 100, credit :2 , CPW :4
Subject Code : **DEE-311S**

Laboratory experiments based on syllabus of **DETC/EE-301** (2nd Half)

7. **C Programming Lab** Subject Code : **DCS-304S**
Total Marks : 100, credit :2 , CPW :4

List of experiments:

1. To do exercise on data type conversion, use of variable of different types.
2. To write simple program using expression, assignment statements and different types of operators.
3. To write simple programs using control statements: if, switch, conditional

operator, for, while, do-while, break and continue statements.

4. Familiarity with formatted and unformatted console I / O with simple programs.
5. To write program using 1D and 2D arrays, sorting and matrix manipulation.
6. Write programs on function, using function prototype declaration, function definition, with or without arguments, returning value or no value, call by value and call by reference, recursive functions.
7. To write program using pointer (int, float and character type) using malloc and calloc functions, pointer to pointer, pointer to function.
8. To write program using structure, accessing structure elements, array of structure, passing structure to function and using structure pointers, using unions, accessing union elements, using structure and union in same function, to write programs on enunciated data type and familiarity with type definition.
9. To write program using different file function.
10. To write program using different macro definition, file inclusion and conditional compilation.
11. To write program using string function and math function.
12. To write program to find base memory use, to make caps lock on and to control the different keys on the keyboard.
To realize Int86 functions.

8. **Digital Electronics Lab** Subject Code : **DETC-305S**
Total Marks : 100, credit :2 , CPW :4

Laboratory experiments based on syllabus of **DETCE –302.**

9. **Network Analysis Transmission Lines Lab** Subject Code : **DETC-306S**
Total Marks : 100, credit :2 , CPW :4

Laboratory experiments based on syllabus of **DETCE –303.**

10. **Electrical Machines Lab** Subject Code : **DEE-307S**
Total Marks : 100, credit :2 , CPW :4

Laboratory experiments based on syllabus of **DEE/HU –304(1ST Half).**

FOURTH SEMESTER

	Theoretical Paper					Sessional / practical paper			
	1 st half (50mark)	2 nd half (50 mark)	Mark	CPW	Credit	Name of Sessional / practical	Mark	CPW	Credit
i	Communication Engineering – I DETC -401		100	4	4	Communication Engineering Lab-I DETC-405S	100	4	2
ii	Microprocessors and Interfacing DETC – 402		100	3	3	Microprocessor and Interfacing Lab DETC-406S	100	4	2
iii	Electronic Devices – II DETC– 403		100	3	3	Electronic Devices Lab-II DETC-407S	100	4	2
	Consumer Electronics	Electronic Measurement							
	DETC-404								
v						Communication Skill Lab HU-400S	100	3	2
vi						Electronic Measurement Lab DETC – 409S	100	4	2
			400	14	14		600	22	12

STUDENTS SHOULD UNDERGO 2 WEEKS INDUSTRY TRAINING AT THE END OF FOURTH SEMESTER (DURING SUMMER VACATION).

FOURTH SEMESTER

1. Communication Engineering-I

Subject Code: **DETC -401**

Total Marks : 100, credit :4, CPW :4

INTRODUCTION TO ELECTRONIC COMMUNICATION: Importance of communication – Elements of a communication system – Types of electronic communication - Electromagnetic spectrum – Bandwidth – Basic idea of Fourier series and Fourier transform.

ANALOG MODULATION: Concept and necessity of modulation. Definition of amplitude, frequency and phase modulation. Derivation of sidebands in AM systems – Evaluation of power – Sideband depth – Percentage of modulation. Methods of AM: Principles of operation of plate modulated Class C amplifier – Collector modulator – Balanced modulator. Expression of sidebands in FM and PM systems and its interpretation – Modulation index and bandwidth requirement Principles of operation of varactor diode modulation. Comparison of AM, FM and PM. Basic ideas of Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM) – Principle of generation and reception of PAM, PWM & PPM with block diagram and their applications.

TRANSMITTING SYSTEMS: Block diagram and function of different stages of AM and FM broadcast transmitter. Working principles of SSB systems with block diagram: Filter Method – Phase Shift Method – Third Method. Cooling and shielding arrangement of transmitter.

DEMODULATION: Principle of detection with diode detector AGC circuit delayed AGC Foster-Seeley discriminator – Ratio Detector – Limiter – Standard AFC Circuits (basic principles only, no derivation).

RECEIVING SYSTEM: Block diagram and principle of operation of super heterodyne receiver – IF amplifier and choice of IF – Mixer and converter – Alignment and tracking – Tone and volume control – Band spreading – Receiver characteristics – Testing. Block diagram and principle operation of FM receiver – Pre-emphasis and de-emphasis – AFC and alignment of FM receiver.

BASIC TELEPHONY: Telephone transmitter – Receiver – Dial tone, side tone and antisidetone circuits – Handset – Ringer – Switch hook – Hybrid – Local loop – Tone dialling – DTMF. Electronic Exchange: Space division switching, time division switching, time slot interchange, line and trunk termination. Concepts of telephone traffics – Erlang – Traffic routing – Circuit occupancy – Junction – Long distance traffic.

PROPAGATION OF WAVES: Elementary concepts about propagation of waves. Propagation of ground wave, space wave and sky wave. Iono-spheric layers – Skip distance – Plasma frequency – Critical frequency – MUF – Virtual height. Duct propagation – Single hop & multi hop – Fading.

References:

- 1) Principles of Communication Systems, Taub & Schilling, TMH.
- 2) Modern Digital and Analog Communication Systems, B. P. Lathi, OUP
- 3) Communication System, Hykin, Wheeler
- 4) Electronic Communication System, Kenndy, TMH
- 5) Electronic Communication, Roody & Coolen, PHI
- 6) Electronic Communication System Fundamentals through Advance, Wayne Tomasi, Pearson Education.

2. Microprocessors and Interfacing

Subject Code: **DETC -402**

Total Marks : 100, credit :3, CPW :3+1T

INTRODUCTION TO MICROPROCESSOR: Generation and evolution of microprocessors. Basic Architecture of 8-Bit Microprocessor. Tristate register and switch.

ARCHITECTURE OF INTEL-8085: registers, timing and control, add buffer and data buffer, interrupts control, serial input and output control, Pin out configuration Demultiplexing and buffering the system bus.

TIMING CYCLE OF 8085: Machine cycle, instruction cycle, Instruction fetch cycle, read cycle and write cycle, Bus idle cycle, Hold and Halt state

PROGRAMMING OF 8085: Software model of 8085A, Addressing modes of 8085A. Classification of instruction and Instruction set of 8085A, Concept of assembly language programming- basic assembler directives and labels.

MEMORY INTERFACING : Generalized internal structure of memory device. Basic bus interface. Address space provided by 8085A, Address decoding. Interfacing ROM, static RAM and dynamic RAM.

I / O INTERFACING AND DATA TRANSFER: Interfacing I/O devices, Address decoding, Isolated I/O versus memory mapped I/O. Synchronous and asynchronous data transfer. Interrupt driven data transfer, single interrupt, multiple interrupt- polling, priority interrupt controller, dairy chaining. Interrupts in 8085A – Software and hard ware – Vectored. Enabling, disabling and masking of interrupts. Direct memory access – Block transfer DMA – Cycle stealing DMA

I / O INTERFACING DEVICES: Functional block diagram and programming of : —
a) 8253(programmable counter), b) 8255(PPI), c) 8279(Keyboard and display controller)
Functional block description and control word development of :—
a) 8237(programmable DMA controller), b) 8259 (programmable interrupt controller), c) 8251 (USART). Interfacing DAC & ADC with 8085.

INTRODUCTION TO 8086: Functional Block Diagram of 8086: Bus interface unit, execution unit, general purpose register, flag register, pointer and index register. Memory address space and generating a memory address. Dynamically allocable relocatable code Dedicated and reserved memory location. Pin configuration of 8086- minimum and maximum mode. Addressing mode of 8086. Instruction set of 8086.

References:

- 1) Microprocessors Architectures and Applications / Gaonkar / New Age International
- 2) Introduction to microprocessors / A. P. Mathur / Tata McGraw-Hill
- 3) Microprocessors: Principles and Applications / A. K. Pal / Tata McGraw-Hill
- 4) Microprocessors Principle and Applications / C. M. Gilmore / Tata McGraw-Hill
- 5) Microprocessors and its applications / Leventhal
- 6) Advanced Microprocessor and Interfacing / Badri Ram / Tata McGraw-Hill
- 7) Microprocessor and Interfacing / Hall / Tata McGraw-Hill.
- 8) Fundamentals Of Microprocessors And Microcomputers, B. Ram, Dhanpat Rai

3. Electronic Devices-II

Subject Code: DETC –403

Total Marks : 100, credit :3, CPW :3

SPECIAL SEMICONDUCTOR DEVICE: General features of Varactor diode – Pin diode – Tunnel diode – Schottky diode – Gunn diode – Impatt diode – Their field of applications.

MULTISTAGE AMPLIFIER: Coupling: RC coupled – Direct coupled – Transformer-coupled amplifiers – Effect on Gain & Bandwidth and Frequency response for cascading – Comparison of different types of cascading.

POWER AMPLIFIER: Characteristics of Class A, Class B, Class C and Class AB amplifier. Difference between Voltage and Power Amplifier. Transformer coupled Class

A Power Amplifier: Circuit operation – Calculation of power, efficiency & distortion.
Class B Push Pull Amplifier: Circuit operation – Calculation of power, efficiency & distortion – Crossover distortion – Advantages and disadvantages – Complementary symmetry and quasi-complementary symmetry Class B Push Pull Amplifier. Noise in amplifier circuits.

TUNED AMPLIFIER: Circuit operation of single tuned and double tuned amplifiers. Features of staggered tuned amplifier and their applications.

FEEDBACK AMPLIFIER: Basic idea of positive and negative feedback – Effect of negative feedback on gain, gain stability, distortion, noise, bandwidth, phase shift, input and output impedances. Voltage and current, series and shunt feedback. Performance of emitter follower circuit – Calculation of gain and input & output impedances – Darlington pair.

OSCILLATORS: Concept of oscillation – Barkhausen criteria. Operation of following sinusoidal oscillators: a) tuned collector, b) Hartley, c) Colpitt, d) Wein-bridge, e) Phase Shift, and, f) Crystal.

MICROELECTRONICS TECHNOLOGY: Advantages of ICs over discrete elements. Types of ICs: Linear and Digital – Monolithic and Hybrid. Planar technology: Crystal growth of wafer – Epitaxial growth – Oxidation – Photolithography – Chemical etching – Diffusion – Ion implantation and metallisation (ideas only). Fabrication of BJT, JFET, MOSFET, diode, resistor and capacitor (salient features).

4. Consumer Electronics & Electronic Measurement. Subject Code : DETC -404

a. Consumer Electronics (1st Half) Total Marks : 50, credit :2, CPW :2

MICROPHONES: Construction, working principle and frequency response of: Carbon Microphone – Variable Reactance Microphone – Capacitance Microphone – Piezo-Electric Microphone – Moving Coil Microphone.

LOUDSPEAKERS: Frequency ranges of musical instruments – Intensity and Dynamic Range – Constructions and working principles of Moving Coil Loudspeaker – Impedance and Power Level of loudspeaker – Frequency characteristics of Practical Loudspeakers: Woofer, Tweeter, Squawker – Loudspeaker Enclosure.

TAPE RECORDERS: Principle of magnetic recording and playback – Requirement of bias – Working principle with block schematic diagram of a tape recorder system.

BLACK AND WHITE TV SYSTEM: Working principle with block diagram of TV transmitter and receiver. Brief description with circuit diagram: TV Tuner – Video IF stage – Sound stage – Picture tube & its associated circuit – Synchronizing circuits – Automatic Gain Control (AGC) – Horizontal & vertical deflection circuits – EHT section – Remote control of a TV receiver

CD PLAYER: Working principle of CD recording and CD playing.

CABLE TV SYSTEM: Channel and cable type of cable TV system – Head end processor – Trunk & cable distribution system with block diagram – Scrambling.

b. Electronic Measurement (2nd Half) Total Marks : 50, credit :2, CPW :2

MEASUREMENT FUNDAMENTALS: Explanation of accuracy, precision, sensitivity, resolution, dynamic range, response and repeatability of measuring instruments. Role of Units in measurements and different types of units – Definition of Errors and type of errors – Definition of Primary and Secondary Standards – Concept of Calibration.

PERMANENT MAGNET MOVING COIL METER: Theory of operation, working principle and construction of PMMC. Measurement of voltage, current and resistance. Loading effect, extension of range and PMMC Multimeter.

ELECTRONIC VOLTMETER & MULTI METER: Advantages of electronic voltmeter over ordinary voltmeter. Working principle of Digital Multi Meter – Different types of DMM: Integration and successive approximation type. Advantages of DMM over Conventional Multi Meter.

CATHODE RAY OSCILLOSCOPE: Block diagram of CRO, constructional features of CRT and principle of operation. Block schematic description of: (a) Vertical Amplifier, (b) Time Base Generator, (c) Trace Synchronization, (d) Triggering Modes, (e) Front Panel Controls, (f) Probe Characteristics. Features of dual trace oscilloscopes, chopper beam switch, alternate beam switch. Block schematic description of digital storage oscilloscope. Measurement of amplitude, frequency, time period, phase angle and delay time by CRO.

TIME & FREQUENCY MEASUREMENT : Measurement of frequency by heterodyne method – Block schematic description of digital frequency counter. Measurement of frequency, time period and time interval through frequency counter.

SIGNAL GENERATOR: Block schematic descriptions, specifications and uses of: Audio & Radio Frequency Signal Generator – Function Generator – Pulse Generator.

References:

- 1) Electronic Measurement and Measurement Technique / Cooper / Prentice Hall of India
- 2) Electronic Instrumentation / Kalsi / Tata McGraw-Hill
- 3) A Course in Electrical and Electronic Measurement and Instrumentation / A.K. Sawhney / Dhanpat Rai & Sons
- 4) Electronic Measurement and Instrumentation / Oliver Cage / McGraw Hill
- 5) Students Reference Manual for Electronic Instrumentation Lab / Wolf and Smith / Prentice Hall of India

- 5) **Communication Engineering Lab-I** Subject Code : **DETC-405**
Total Marks : 100, credit :2, CPW :4
Laboratory experiments based on syllabus of **DETC –401.**
- 6) **Microprocessor and Interfacing Lab** Subject Code : **DETC-406**
Total Marks : 100, credit :2, CPW :4

Laboratory experiments based on syllabus of **DETC –402.**
- 7) **Electronic Devices Lab-II** Subject Code : **DETC-407**
Total Marks : 100, credit :2, CPW :4

Laboratory experiments based on syllabus of **DETC –403.**
- 8) **Consumer Electronics Lab** Subject Code : **DETC-408**
Total Marks : 100, credit :2, CPW :4

Laboratory experiments based on syllabus of **DETC –404 (1st Half).**
- 9) **Communication Skill Lab** Subject Code : **DHU-400S**
Total Marks : 100, credit :2, CPW :4

COMMUNICATION SKILL-II (DHU 400S)

1st half (For all Discipline)

Total Marks : 100, CPW : 4 , Credit : 2

DETAIL COURSE CONTENT

LOOKING FOR A JOB

Identifying Sources — Skimming Newspapers for Information

JOB INTERVIEWS *

Preparing for an interview — Responding Appropriately — Group Discussions — Using Language Effectively for Interaction

* Mock interviews are to be arranged and to be conducted by any suitable person

AT THE WORKPLACE

Preparations of CV, performance testing on the skill of writing business and official letters, memos and tenders etc., presentation skill, preparations of instruction manuals, maintenance of office files and correspondences etc.

TEXT BOOK AND OTHER RECOMMENDED BOOKS

ENGLISH SKILLS for Technical Students – TEACHERS’ HANDBOOK / West Bengal State Council of Technical Education in collaboration with THE BRITISH COUNCIL / Orient Longman – Business Correspondence and Report Writing, by Krishna Mohan &

C. Sharma – Business Correspondence, by V.G. Natu and C Kaur – Professional Communication Skills, by Pravin Bhatia and A.M. Shaikh – A Guide to Business Correspondence and Communication Skills, by A.N. Kapoor – English Grammar, by Wren & Martin

10) Electronic Measurement Lab

Subject Code : **DETC-409S**

Laboratory experiments based on syllabus of **DETC –404** (2nd Half).

FIFTH SEMESTER

	Theoretical Paper					Sessional / practical paper			
	1 st half (50mark)	2 nd half (50 mark)	Mark	CPW	Credit	Name of Sessional / practical	Mark	CPW	Credit
	Industrial Management	Entrepreneurs hip Development							
	DHU -501								
ii	Communication Engineering – II DETC – 501		100	4	4	Industrial Electronics Lab DETC-504S	100	4	2
iii	Industrial Electronics DETC– 502		100	3+1T	3	Industrial Training** DITS-500S	100		2
iv	Computer Architecture and Organization DCS-509		100	3+1T	3	Project - I DETC – 505S	100	4	2
v						Electronic CAD and Matlab™ Basics Lab DETC-506S	100	4	2
vi						PCB Design Lab DETC – 507S	100	4	2
			400	16	14		600	20	12

** Two weeks Industrial Training After 4th Semester (during Summer Vacation)

FIFTH SEMESTER

1. Industrial Management & Entrepreneurship Development

Subject Code : **DHU-501**

a. Industrial Management (1st Half) Total Marks : 50, credit :2, CPW :2

Introduction to Management Science

Principles & functions of management — Contributions of F.W. Taylor, Henry Fayol, Max Weber in development of the theories of management science.

Organisational Behaviour

Objectives — Brief introduction to: Motivation– Perception – Leadership & Leadership

Styles – Communication – Team Building – Work Culture.

Human Resources Management

Scope & Functions – Human Resources Planning – Selection & Recruitment – Training & Development – Performance Appraisal .

Production & material Management

Production Planning: Routing – Loading – Scheduling — Production Control: Expediting – Dispatching — Materials Handling Inventory Management Inventory Management — Productivity — Quality Management: Tools & Techniques – Quality Management System.:

Financial Management

Financial Ratios — Elements of Costing — Auditing

Marketing & Sales Management

Marketing of products & Services — Advertising & Sales Promotion — Consumer Behaviour

REFERENCE BOOKS

Essentials of Management / Kontz / McGraw-Hill of India

Organization & Behaviour / M. Banerjee / Allied Publishers

Human Behaviour at Work: Organizational Behaviour / Keith Davis & Newstrom / McGraw-Hill of India

Human Resources Management / Mirza Saiyatin / Tata McGraw-Hill

Production Management & Control / Nikhil Bharat / U.N. Dhar & Co.

Production Management / Keith Lockyer / ELBS

Marketing Management / Philip Kotler / Prentice Hall of India

Lectures on Management Accounting / Dr. B.K. Basu / Basusri Bookstall, Kolkata

An Insight into Auditing: A Multi-dimensional Approach / Dr. B.K. Basu / Basusri Bookstall, Kolkata

Business Strategies, Financial Management & Management Accounting / S.K. Poddar / The Association of Engineers (India)

b. Entrepreneurship Development (2nd Half) Total Marks: 50, credit :2, CPW :2

Entrepreneurial Development

Definition of entrepreneurship, Characteristics of entrepreneurship, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs.

Need for promotion of entrepreneurship, Entrepreneurial Environment, Govt. policies for setting-up new small enterprises.

Planning a SSI

What is planning, Types of planning, Importance of planning, Steps in planning.,Steps for starting a small enterprise. ,Commercial Banks and Financial Institutions.

Problems of Small Industries

Power shortages, Project planning, Finance.,Raw materials, Production constraints, Marketing. ,Personal constraints, Regulation., Entrepreneurial Motivation Training, Motivating factors of Entrepreneurs, Achievement Motivation, Institutions assisting entrepreneurs.

REFERENCE BOOKS

Starting your own business, A step-by-step Blue print for the first-time Entrepreneur – Stephen C. Harper, McGraw-Hill

Harward Business Review on Entrepreneurship – Harward Business School Press.

Entrepreneurship Development in small scale – proceedings of National Seminar, DCSSI, New Delhi – Patel, V.G.

Entrepreneurship: Strategies & Resources – Abrams Grant Pass. Oregon: Oasis press.

The Business Planning Guide – David H Bangs, Upstart Publishing Company in Chicago.

Entrepreneurship Development in India – Dr. C.B. Gupta, Dr. N.P. Srinivasan, Sultan Chand & Sons.

Entrepreneurship – Madhurima Lall and Shikha Sahai, Excel Books.

2. Communication Engineering-II

Subject Code: **DETC-501**

Total Marks : 100, credit :4, CPW :4

PULSE CODE MODULATION: Idea of digital communication – Advantages of digital communication over analog communication. Information theory – Hartley-Shannon law – Basic principle of coding. Basic steps in PCM system: Filtering – Sampling – Quantizing – Encoding – Line coding (HDB3, AM1, CM1, NRZ, RZ). Block schematic description of transmitter and receiver of PCM system. Principles of linear and non-linear, quantization – Companding. Principles of amplitude shift keying, frequency shift keying and phase shift keying. Comparison between ASK, FSK and PSK. Basic idea of Quadrature Amplitude Modulation.

DELTA MODULATION: Block schematic description of delta modulation technique. Limitations of delta modulation – Slope overload and granular noise. Concept of adaptive delta modulation technique.

MULTIPLEXING: Idea of multiplexing and its necessity. Types of multiplexing: TDM and FDM. TDM: Principles of time division multiplexing and synchronization in a digital communication system. PCM – TDM in modern applications (plesiochronous digital hierarchy and synchronous digital hierarchy). Frequency division multiplexing with practical examples, phase locked loop. Merits and demerits of TDM and FDM.

MICROWAVE AMPLIFIER: Problems associated with conventional tubes at microwave frequency. Basic idea of amplification with velocity and density modulation in case of Multi-cavity Klystron and Travelling Wave Tube – Their efficiency, power output & frequency range of operation (no deduction) – Field of applications.

ANTENNA & WAVEGUIDE: Basic principles of antenna — Different types of antenna: Dipole antenna – Half wave and folded, microwave antenna – Horn antenna, parabolic antenna and helical antenna. Properties of antenna: Gain – Bandwidth – Beam Width – Impedance – Radiation Pattern. Antenna Arrays: Driven array and parasitic array. Wave Guides: Rectangular – Circular & Elliptical – Wave Guide Modes. Microwave Components: Directional Coupler – Attenuator – Isolator – Circulator.

References:

- 1) Principles of Communication Systems, Taub & Schilling, TMH.
- 2) Modern Digital and Analog Communication Systems, B. P. Lathi, OUP
- 3) Communication System, Hykin, Wheeler
- 4) Electronic Communication System, Kenndy, TMH
- 5) Electronic Communication, Roody & Coolen, PHI
- 6) Electronic Communication System Fundamentals through Advance, Wayne Tomasi, Pearson Education.
- 7) Digital Communications: Fundamental And Applications, Sklar, Pearson
- 8) Digital Communications, Prokias, MGH

3. Industrial Electronics

Subject Code: **DETC-502**

Total Marks : 100, credit :3, CPW :3+1T

POWER DEVICES: Principle of operation of power BJT and IGBT with output characteristics. Switching characteristics of power diodes, power transistors; power MOSFET, IGBT, SCR. Protection of power devices overload protection, fuse protection, circuit breakers, transient protection, Zener, metal oxide resistors, turn on and odd snubber and transient voltage suppressor. Losses in power devices- on state losses, switching losses, losses in BJT, MOSFET and IGBT.

OPERATIONAL AMPLIFIER: Basic differential amplifier circuit. Importance of constant source. Definition of input offset voltage, input bias current, input impedance, input offset current, output impedance open loop voltage gain, differential mode gain, common mode rejection ratio, slew rate. Properties of op-amp; pin diagram and functions of each pin of IC 741 (Nature of power supply required.). Inverting amplifier – circuit diagram and explanation, gain calculation. Non-inverting amplifier – circuit diagram and explanation and gain calculation. Op amp as: Comparator, adder, subtractor, integrator, differentiator unity gain buffer and scale changer. Function generator (square, triangular) Schmitt trigger.

SWITCHING & TIMER CIRCUIT: Simple transistor timer using R-C as timing element. Classification of multi-vibrators. Astable multi-vibrators, monostable multi-vibrators, bistable multi-vibrators, circuits using discrete components. Explanation and study of pin out diagram. Internal block diagram and operating of IC 555. Application of IC 555 timer as – Astable multi-vibrator, mathematical expression for t_H and t_L , frequency of Oscillation and duty cycle. Monostable – mathematical expression for duration of high pulse.

PROGRAMMABLE LOGIC CONTROLLER: Definition of programmable logic control system, advantages of PLCs. Block diagram of PLC system. Programming of PLCs, different methods Ladder programming of simple systems like traffic light controller. List of various PLCs different methods.

CONTROL OF DC AND AC MOTOR: SCR power supply for DC motor, speed regulation by armature voltage control. Speed control of AC induction motor (variable voltage control) Advantage of AC motor control DC motor. Types and principle of

operation of stepper motor. Stepper Motor Control: Stepper Drive – Dual Voltage Drive – Chopper Drive.

SWITCH MODE POWER SUPPLY: Principle of operation of buck converter, boost converter and buck-boost converter. Principle of operation of a PWM switching regulator using IC 3524 Advantage of AC motor control over DC motor.

A.C. POWER CONDITIONER CKTS: Block schematic description of uninterrupted power supply. Block diagram & brief study and CVT

References:

- 1) Power Electronics, P.C. SEN, TMH
- 2) Industrial Electronics & Control, S. K. Bhattacharya (TTTI), TMH
- 3) Power Electronics, Singh & Kanchandani, TMH
- 4) Power Electronics & Control, S.K. Dutta, PHI
- 5) Industrial Electronics, S.N. Biswas, Dhanpat Rai
- 6) Industrial Electronics, Biswanath Pal, PHI
- 7) Power Electronics Converter Application and Design, Mohon, W.I.Ltd.
- 8) Power Electronics, Rashid ,Pearson Education /PHI

4. Computer Architecture and Organization Subject Code : **DCS-509**
Total Marks : 100, credit :3, CPW :3

INTRODUCTION: Arithmetic with Signed Magnitude Data: Addition, Subtraction, Multiplication, Division. Hardware Implementation and Algorithm: Addition, Subtraction, Multiplication, Division. Floating Point Arithmetic Operation: Basic consideration, Register Configuration, Addition, Subtraction, Multiplication and Division.

CONTROL UNIT: Hardware Control with an example. Micro programmed Control-Control Memory, Computer Configuration.

CENTRAL PROCESSING UNIT: Stack Organization: Register Stack, Memory Stack, Revised Polish Notation, Evaluation of Arithmetic Expression; Introduction to Register Transfer Language(RTL). Interrupts: S/W and H/W Interrupts, Vectored and Non-Vectored Interrupts, Priority Interrupts, Interrupts Handling. RISC and CISC Architecture.

PIPELINE & VECTOR PROCESSING: Parallel Processing, Pipelining : General Consideration, Arithmetic Pipeline, Instruction Pipeline (with example), RISC Pipeline (with example), Vector Processing: Vector operation, Matrix multiplication, Memory interleaving.Array Processor : SIMD Array processor, Problems.

INPUT OUTPUT ORGANIZATION: I/O Interface: I/O Bus and Interface Modules, I/O versus Memory Bus, Isolated versus Memory-Mapped I/O, Example of I/O Interface.

Input-Output Processor: CPU-IOP Communication.

MEMORY ORGANIZATION: Cache memory: Associative mapping, Direct mapping, Set-associative mapping, Writing into Cache, Cache Initialization, Cache level 1, level 2. Virtual Memory: Address space and Memory space; Address mapping using Pages, Associative memory page table, Page replacement.

References:

- 1 Computer Architecture & Organisation, Hayes J. P., TMH,
- 2 Computer Organisation, Hamacher
- 3 Computer Organization and System Software, EXCEL BOOKS
- 4 Computer Organisation & Design, Chaudhuri P. Pal, PHI
- 5 Computer System Architecture, Mano, M.M., PHI.
- 6 System Architecture, Burd- Vikas

7 Communication Engineering Lab-II Subject Code : **DETC-503S**
Total Marks : 100, credit :2, CPW :4
Laboratory experiments based on syllabus of **DETC –501.**

c. Industrial Electronics Lab Subject Code : **DETC-504S**
Total Marks : 100, credit :2, CPW :4
Laboratory experiments based on syllabus of **DETC –502.**

d. Industrial Training Subject Code : **DETC-500S**
Total Marks : 100, credit :2, CPW :4

All the students must undergo at least 2 weeks Industrial training to local / outside company /organization after completion of 4th semester examination.

A feedback form will be taken from the respective industry which will indicate the student's performance during the training and same will be reflected on the grade card of 5th semester

e. Project-I Subject Code : **DETC-505S**
Total Marks: 100, Credit: 2, CPW: 4

f. Electronic CAD and Matlab™ Basics Lab Subject Code : **DETC-506S**
Total Marks : 100, credit :2, CPW :4

List of experiments:

List of Experiments:

Design following and analysis of the following circuits in any Electronics CAD Software (not limited to):

1. Frequency Response of CE Amplifier
2. Frequency Response of CS Amplifier
3. Design of Wein-Bridge Oscillator
4. Design and Verification of Class-A Power Amplifier
5. Verification of Half-wave and Full-wave rectifier
6. Verification of Amplitude Modulation and Demodulation

Design following and analysis of the following circuits in MATLAB™ (not limited to):

1. Study of Basics of MATLAB™.
2. Matrix operation (addition, subtraction, multiplication, division, transpose, inverse etc.)
3. Laplace transform, Fourier Transform, Polynomial etc.
4. Simulation of AM
5. Simulation of FM
6. Simulation of LPF and HPF
7. Fourier Transforms
8. Simulation of M-ary PSK
9. Simulation of DPCM

g. PCB Design Lab

Subject Code : **DETC-507S**

Total Marks : 100, credit :2, CPW :4

1. Study of Single layer and double layer PCB manufacturing process.
2. Development of Single layer PCB for common circuits like rectifier, amplifier etc.

SIXTH SEMESTER

	Theoretical Paper					Sessional / practical paper			
	1 st half (50mark)	2 nd half (50 mark)	Mark	CPW	Credit	Name of Sessional / practical	Mark	CPW	Credit
	Professional Ethics & Values	Optimisation Technique							
	DHU -601								
	Instrumentation	Control Engineering							
	DETC/EE-601								
iii	Elective DETC- 602		100	3	3	Project – II DETC-605S	200	8	2
						Grand Viva#			
						General Skill			
						DETC-606S			
v						Object Oriented Programming Lab DCS-611	100	3	2
			400	14	14		600	22	12

Elective Subjects: 1) Advanced Microprocessors and Microcontrollers. 2) Fibre Optic Communication. 3) Microwave Engineering. 4) Television Engineering. 5) Computer Network

SIXTH SEMESTER

1. Professional Ethics & Values and Optimization Technique

Subject Code: DHU -601

- a. PROFESSIONAL ETHICS & VALUES (DHU-601) 1st half**
Total Marks: 50, Credit: 2 , CPW : 2

DETAIL COURSE CONTENT

Effects of Technological Growth:

Rapid Technological growth and depletion of resources. Reports of the Club of Rome. Limits to growth; sustainable development. Energy Crisis; Renewable Energy Resources. Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations. Environmental Ethics. Appropriate Technology Movement of Schumacher: later developments. Technology and developing nations. Problems of Technology transfer. Technology assessment/ impact analysis; Industrial hazards and safety, safety regulations safety engineering. Politics and technology, authorization versus democratic control of technology; Human Operator in Engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centered Technology

Ethics of Profession:

Engineering profession: Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and ethical Responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond. Case studies.

Profession and Human Values :

Value Crisis in contemporary society. Nature of values: Value Spectrum of a 'good' life
Psychological values: Integrated personality; mental health. Societal values: The modern search for a 'good' society, justice, democracy, secularism, rule of law; values in Indian Constitution. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity
Moral and ethical values: Nature of moral judgments; canons of ethics; Ethics of virtue; ethics of duty; ethics of responsibility. Work ethics, professional ethics.

REFERENCE BOOKS:

1. Blending the best of the East & West, Dr. Subir Chowdhury, EXCEL
2. Ethics & Mgmt. & Indian Ethos, Ghosh, VIKAS
3. Business Ethics, Pherwani, EPH
4. Ethics, Indian Ethos & Mgmt., Balachandran, Raja, Nair, Shroff Publishers
5. Business Ethics: concept and cases, Velasquez, Pearson

OPTIMIZATION TECHNIQUE**b. Optimization Technique (2nd Half)****(DHU 601)****2nd half, Total Marks: 50, Credit: 2 , CPW : 2**

Introduction to Operation Research & Optimization technique

Linear Programming :

Introduction to linear programming, Formulation, LPP in the standard form, LPP in canonical form, conversion of LPP in standard form to canonical form, procedure of solving LPP by graphical method.

Introduction to Simplex method, Simplex algorithm.

Shortest path **DJKstra** method.

Project Scheduling :

Project scheduling by PERT/ CPM, Decisions and game theory,

Classical optimization theory, unconstrained External problem.

REFERENCE BOOKS :

2. Instrumentation and Control Engineering

subject Code: **DETC/EE-601**

a. Instrumentation (1st Half) Total Marks: 50, Credit: 2 , CPW : 2

TRANSDUCERS FUNDAMENTALS: Principle of operation of transducer and sensor – Their applications – Factors affecting the choice of transducer. Measurement of physical quantities with transducer, displacement, potentiometer, LVDT, strain gauge, piezoelectric crystal. Tachogenerator, resolution counters. Pressure: Manometer – Elastic type- Bourdon tubes – Diaphragm – Bellows. Temperature: RTD – Thermistors – Thermocouple. Flow: Positive displacement – Electromagnetic heat – Thermal heat. Other applications like measurement of pH and conductivity. Transducer as system components. Input-Output Specification – Sensitivity – Accuracy – Repeatability – Resolution – Hysteresis. Factors for choice of transducer.

POSITION & DISPLACEMENT MEASUREMENT: Principle of Potentiometric Transducer. Capacitance Transducer. Linear Variable Differential Transformer.

PRESSURE OF FORCE & VIBRATION MEASUREMENT: Representative unit of pressure of force. Primary pressure of force sensing alignments. Electrical transducer alignments — Electrical strain gauges: Types – Gauge Factor – Temperature Specification. Semiconductor Strain Gauges: Properties of piezoelectric alignments, application.

TEMPERATURE MEASUREMENT: Basic types of temperature transducer: Resistance detectors, thermistors, thermocouple — Principle of operation, specifications, features and applications. Application of platinum thin film and sensors.

SIGNAL CONDITIONING: Signal conditioning requirements for AC and DC transducer signal. Transducer circuit modification. Specification and characteristics of instrumentation amplifier. Signal processing. Features and advantages of computerized data acquisition.

References:

- 1) Electronic instrumentation / Kalsi / Tata McGraw-Hill
- 2) Industrial Instrumentation and Control / S.K. Singh / Tata McGraw-Hill
- 3) Numericals / Y. Koren & J. BEN / URI
- 4) Programmable Controllers Hardware, software and applications / G.L. Battin / McGraw Hill
- 5) Electronic Instrumentation and Measurement / D.A. Bell / Prentice Hall of India

b. Control Engineering (2nd Half) Total Marks: 50, Credit: 2 , CPW : 2

INTRODUCTION TO CONTROL ENGINEERING: Examples of control system. Classification of control system. Representation of control system. Transfer function. Block diagram of a feedback control system. Simplification of a feedback control system.

SYSTEM ELEMENT BEHAVIOUR: Standard test. The steady state and transient response. Steady State Error – Rise Time – Delay Time – Settling Time. Damping: Over damped – Under damped – Critically damped. First order and second order response – Examples.

CLOSED LOOP SYSTEM: Introduction to Routh stability and Nyquist criteria. Analog computers: Multiplication by factor – Solving differential equation – Magnified scale factor – True scale factor. Analog computer simulation of physical systems. Example of frequency response. Root Locus technique.

References:

- 1) Control System Engineering, R. Ananda Natarajan & P. Ramesh Babu, Scitech, Chennai.
- 2) Kuo B.C. Automatic Control System, PHI
- 3) Das Gupta S : Control System Theory ; Khanna Pub.
- 4) Nagrath I. J. & Gopal M : Control Systems Engineering, New Age International Pub.
- 5) Ogata K : Modern Control Engg. PHI.

03. ELECTIVE (DETC – 602) Total Marks: 100, Credit: 3 , CPW : 3+1T

The Student has to choose one of the following Subject as ELECTIVE

1. Advanced Microprocessors and Microcontrollers (DETC-602/1)

INTERFACING TECHNIQUES OF CPU SUPPORT CHIPS: Comparison between 8086 and 8088. Interfacing system clock 8284. Interfacing bus controller 8288. Floating point process of 8087 and its interfacing.

INTERRUPTS & DMA CONTROLLER: Interfacing of a DMA controller 8257. Interfacing of an interrupt controller 8259. Interrupt vector table. Interrupt Types: Software interrupt – External maskable interrupt – Non-maskable hardware interrupt. Priority in interrupt.

ADVANCED MICROPROCESSORS: Concept of virtual and cache memory. Multi-Tasking & Multi-User Operating System: Prescribing the environment – Accessing resources – Need for protection. Memory management. 80286: Architecture – Real address mode – Protected virtual address mode. Memory Management Scheme: Descriptors – Accessing segments – Selecting address translation register – Physical address. Protection schemes – Task switching – Gates. 80386: Basic features of 80386 compared to 80286. 80486: Features of 80486 – Internal cache memory support –

Comparison with 80386. Pentium Processor: Concept of super scalar – Dual pipeline architecture – Comparison with 80486.

SERIAL INPUT OUTPUT INTERFACE: Basic of serial I/O: Synchronous and asynchronous transfer. Functional description – Interfacing of 8251(USART). Communication: Simplex – Duplex – Full duplex. Serial I/O Bus Standard and RS232 signals. Concept of Universal Serial Bus.

PARALLEL INTERFACE: Centronics interface standard for parallel communication. Bi-directional standard for parallel ports (SPP & EPP).

SINGLE CHIP MICROCONTROLLER: Programming model of 8051: CPU – Address bus – Data bus – Control bus – Register – Internal RAM and ROM – Ports (serial and parallel) – Timers – Interrupts. Address Modes: Immediate – Register – Direct – Indirect – Indexed. Instruction Types: Arithmetic – Logical – Data Transfer (Internal/External) – Boolean. Control Transfer and Special Function Register. Programming of 8051 micro controller.

References:

- 1) Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989 by Ramesh S. Gaonkar.
- 2) Advanced Microprocessors by Ray and Bhurchandi - TMH
- 3) Microprocessors and Interfacing by Douglas V. Hall, McGraw Hill International Ed. 1992
- 4) Assembly Language Programming the IBM PC by Alan R. Miller, Subex Inc, 1987.
- 5) Fundamentals Of Microprocessors And Microcomputers, B. Ram, Dhanpat Rai.
- 6) Advanced Microprocessors and Interfacing, B. Ram, TMH.
- 7) B. B Bery, “The INTEL Microprocessors 8086/8088, 80186/80188, 80286, 80386 80486, PENTIUM, and PENTIUM pro processor”, Prentice Hall, 1997.
- 8) The 8051 Micro-controller, Ayala, Penram
- 9) The 8051 Microocntroller and embedded Systems by: - Ali Mazidi, Pearson

2. Fibre Optic Communication (DETC-602/2)

INTRODUCTION TO OPTICAL FIBERS: Evolution of fiber Optic system – Element of an Optical Fiber Transmission link – Ray Optics – Optical Fiber Modes and Configurations – Mode theory of Circular Wave guides – Overview of Modes – Key Modal concepts – Linearly Polarized Modes – Single Mode Fibers – Graded Index fiber structure.

SIGNAL DEGRADATION IN OPTICAL FIBERS: Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides – Information Capacity determination – Group Delay – Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers – Polarization Mode dispersion,

Intermodal dispersion, Pulse Broadening in GI fibers – Mode Coupling – Design Optimization of SM fibers – RI profile and cut-off wavelength.

FIBER OPTICAL SOURCES: Direct and indirect Band gap materials – LED structures – Light source materials – Quantum efficiency and LED power, Modulation of a LED, Laser Diodes – Modes and Threshold condition – Rate equations – External Quantum efficiency – Resonant frequencies – Laser Diodes structures and radiation patterns – Single Mode lasers – Modulation of Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers.

FIBER OPTICAL RECEIVERS: PIN and APD diodes – Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise – Comparison of Photo detectors – Fundamental Receiver Operation – pre-amplifiers - Error Sources – Receiver Configuration – Probability of Error – The Quantum Limit.

DIGITAL TRANSMISSION SYSTEM: Point-to-Point links – System considerations – Fiber Splicing and connectors – Link Power budget – Rise-time budget – Noise Effects on System Performance – Operational Principles of WDM, Solutions.

References:

- 1) Gerd Keiser, “Optical Fiber Communication” McGraw-Hill International, Singapore, 3rd ed., 2000
- 2) J.Senior, “Optical Communication, Principles and Practice”, Prentice Hall of India, 1994.
- 3) J.Gower, “Optical Communication System”, Prentice Hall of India, 2001.

3. Microwave Engineering (DETC-602/3)

MICROWAVE NETWORK THEORY: Introduction, Symmetrical Z and Y matrices for reciprocal network, Scattering matrix representation of multi port network properties of S-parameters, S matrix of a two port network with mismatched load, comparison between [S], [Z] and [Y] matrices. Relationship between Y, Z and ABCD parameters with S parameters, Numerical Problems.

MICROWAVE PASSIVE DEVICES:

Coaxial Connectors and Adapters, Wave guide Choke Flanges, Matched Terminations, Short Circuit Plunger, Rectangular to circular wave guide transition, Tuning screws, Wave guide Corners, Bends and Twists, Windows, Coaxial line to Wave guide Adapters, Coupling Loops and Coupling Aperture, Attenuators, Phase shifters, Wave guide Tees - E plane Tee, H plane Tee, Magic Tee and their applications, Isolators, Circulators, Directional couplers. Scattering matrix derivation for all components, Numerical Problems.

MICROWAVE VACUUM TUBE DEVICES: Introduction, Two cavity Klystron Amplifier – Mechanism and mode of Operation, Power output and Efficiency, Mode Curve, Equivalent circuit and Voltage gain, Beam loading; applications, Reflex Klystron Oscillator – Mechanism and mode of Operation Power output, efficiency, mode curve,

equivalent circuit, Electronic Admittance, Modulation of Reflex Klystron; Applications, TWT amplifier, Principle of Operation gain and applications; Magnetron Oscillator – Hull cut-off voltage, Mechanism of Operation, Mode separation, Phase focusing, Power output and Efficiency, Applications, Numerical Problems.

MICROWAVE SOLID STATE DEVICES AND CIRCUITS: Microwave diodes – Crystal diode, Schottky diode, Harmonic Mixer; PIN diode – Operation switches, Phase switches & Attenuators – Gun diode – Mode of operation, Oscillator Circuit, IMPATT diodes – Mechanism of Operation, Application as Oscillator and Amplifiers, Tunnel diodes Oscillator amplifiers, Varactor diode – VCO, parametric amplifier, Microwave transistors – Unipolar and Bipolar, Applications, Numerical Problems.

MICROWAVE MEASUREMENTS: Introduction, Tunable detector, Slotted line Carriage, VSWR meter, Spectrum analyzer, Network Analyzer, Power measurements – Schottky Barrier diode sensor, Bolometer sensor, power sensor, High power measurement, Insertion loss and Attenuation measurement, VSWR measurement – Low and High VSWR, Impedance measurement. Frequency measurement, Measurement of cavity Q, Dielectric measurement of a solid by Wave-guides method, Antenna Measurement – radiation pattern, Phase and gain.

References:

- 1) Annapurna Das, Sisir. K.Das, “Microwave Engineering”, Tata McGraw-Hill Co., Ltd., 1999. Reprint 2001.
- 2) Collin. R.E, “Foundation of Microwave Engineering”, McGraw-Hill, II Edition, 1992.
- 3) Samuel.Y.Liao, “Microwave devices and Circuits”, Prentice Hall of India Pvt Ltd., 1995.
- 4) Reich J.H.et al, “Microwave’ East West Press, 1978.
- 5) K.C.Gupta, “Microwaves” Wiley Eastern Ltd, 1995.

4. Television Engineering (DETC-602/4)

INTRODUCTION : TV transmitter and receivers, synchronization. Television Pictures: Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal: Horizontal and vertical sync, scanning sequence. Colour signal generation and Encoding: Perception of brightness and colours, additive colour mixing, video signals for colours, luminance signal, colour difference signals, encoding of colour difference signals, formation of chrominance signals, PAL encoder.

TV SIGNAL TRANSMISSION AND PROPAGATION : Picture signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW, TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

TV CAMERAS : Camera tube types, Vidicon, Silicon Diode Array Vidicon, Monochrome TV camera, color camera. CCD Image Sensors.

PICTURE TUBES : Monochromatic Picture tube, Electrostatic focussing, Beam deflection, picture tube characteristics and specifications, colour picture tubes.

TV Standards: American 525 line B&W TV system, NTSC colour system, 625-line monochrome system, PAL colour system, TV standards.

MONOCHROME TV RECEIVER : RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits.

PAL-D Colour Receiver: Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Colour Phasors, synchronous demodulators, Subcarrier generation, raster circuits.

VISION IF SUBSYSTEM : AGC, noise cancellation, video and intercarrier sound signal detection, vision IF subsystem of Black and White receivers, Colour receiver IF subsystem. Receiver sound system: FM detection, FM Sound detectors, typical applications. TV Receiver Tuners: Tuner operation, VHF and UHF tuners, digital tuning techniques, remote control of receiver functions.

COLOUR SIGNAL DECODING : PAL – D decoder, chroma signal amplifiers, separation of U and V signals, Color burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, Indent and colour killer circuits, RO phase shift and 180° PAL–SWITCH circuitry, U & V demodulators, Colour signal mixing.

SYNC SEPARATION, AFC AND DEFLECTION OSCILLATORS : Synchronous separation, k noise in sync pulses, separation of frame and line sync pulses. AFC, single ended AFC circuit. Deflection Oscillators, deflection drive Ics. Receiver Antennas. DIGITAL TV Digital Satellite TV, Direct to Home Satellite TV, Digital TV Receiver, Digital Terrestrial TV.

References:

1. Modern Television Practice – Principles, Technology and Service – R.R. Gulati, New Age International Publication, 2002.
2. Monochrome and Colour TV – R.R. Gulati, New Age International Publication, 2002.
3. Colour Television Theory and Practice – S.P. Bali, TMH, 1994.
4. Television and Video Engineering - A.M. Dhake, 2nd Edition.
5. Basic Television and Video Systems – B. Grob and C.E. Herndon, McGraw Hill, 1999.

5. Computer Network

Subject Code: **(DETC-602/5)**

Introduction of Computer Networks and Data Communication Services. Roles of Network Hardware and structured Network software. The Reference Models: OSI, TCP/IP. Mention of Physical layers and significance of circuit switching, packet switching, message switching, and ISDN services. ATM and transmission in ATM network, Advanced mobile phone system (AMPS). Concept of global system for mobile communication (GSM), satellite and fiber optic networks. Design of data link layer, data

link protocol, framing, error and flow control. Error detection and correction. Example of data link protocol. The multi-access channel, multiple access protocols, wireless LAN protocols, IEEE standards. Network layers, its internal organization, routing algorithms, hierarchical routing, routing for mobile hosts, congestion control algorithms. The network layer in Internet, the IP protocol/addresses/header. The network layer in ATM networks. Transport layer services, Internet transport protocols, the ATM AAL layer protocols, protocols for Gigabit networks. Network security concepts. The Electronic Mail, Email gateways, the World Wide Web, Multimedia concepts.

References:

- 1) Andrew S. Tanenbaum, *Computer Networks*, 4/e, Pearson education, 2003
- 2) Uyles Black, *Computer Networks - Protocols, Standards and Interfaces*, Prentice Hall India, New Delhi, 1994
- 3) S. Keshav, *An Engineering Approach to Computer Networking*, Pearson education, 2002
- 4) Halsall, *Data Communication, Computer Networks and Open Systems*, Addison Wesley, 1996
- 5) William A Shay, *understanding communication and networks*, Brooks/Cole, 2/e.
- 6) Behrouz A. Fourouzan, *Data Communications and Networking*, 2/e Tat McGrawhill, 2000
- 7) Leon-Garcia and I. Widjaja, *Communication Networks*, Tata McGraw Hill, 2000
- 8) Bertsekas and Gallagar, *Data Networks*, 2/e, PHI, 1992
- 9) Douglas Comer and David L. Stevens, *Internetworking with TCP/IP Vol. I, II, and III*, Prentice Hall, New York, 1990
- 10) Richard Stevens. W, *TCP/IP Utilities - Vol. I, The protocols*, Addison Wesley, 1994
- 11) Sidnie Feit, *TCP/IP, Architecture, Protocols and implementation*, McGraw-Hill, New York, 1993
- 12) Miller, *Data & Network Communications*, Vikas Thomson

04. Advanced Communication

Subject Code: **DETC-603**

Total Marks: 100, Credit: 3, CPW : 3

PERFORMANCE & TESTING OF DIGITAL COMMUNICATION LINK: Information Theory: Relationship between data speed and channel bandwidth – Shannon-Hartley theorem – Theory of line coding. Error Correction Techniques: Parity checking and cyclic redundancy check. Bit error rate performance with pseudo noise sequence generation, jitter. Block schematic idea of digital transmission analyzer. Brief description of inter-symbolic interference and interpretation of eye pattern.

RADAR SYSTEMS: Block schematic description of simple radar system – Plan position indicator, frequency and power range of radar system – Operation of duplexer. Block schematic description of pulsed radar system and moving target indicator including Doppler Effect, blind speed. Operation of instrument landing system.

SATELLITE COMMUNICATION: Kepler's Law – Artificial Satellite – Orbits – Geostationary Orbit – Satellite Speed – Power Systems – Satellite Angles – Station Keeping – Satellite Launching – Attitude Control. Transponder and satellite frequency allocations – Frequencies reuse. Block schematic description of communication satellite – Elementary idea of FDMA and TDMA.

OPTICAL COMMUNICATION: Concept of fibre optic communication system – Advantages and limitations of optical fibre communication – Construction of optical fibre – Optical fibre types: Monomode and Multimode. Optical Fibre Performance: Bandwidth-distance product – Transmission loss. Optical Sources: LED and LASER – Modulation of LED and LASER – Functions of optical detectors. Block schematic description of optical fibre communication system. Components of optical fibre – Coupler connector splice. Fibre Distributed Data Interface – Synchronous optical network. Multiplexing on optical fibre cable – Wavelength division multiplexing (basic idea only). Applications of fibre optics.

SPREAD SPECTRUM COMMUNICATION: General concepts, frequency hopping, the frequency hopping transmitter, the frequency hopping receiver, time hopping, Antijam consideration. CDMA. Telemetry and Remote sensing: Telemetry definition, different types, Applications, Image characteristics, contrast ratio, spatial resolution, resolving power, brightness, tones etc. Remote sensing system: Framing systems, scanning systems, characteristics of aerial photographs, spatial and ground resolution, relief displacement etc. IR detection and imaging technology - characteristics of IR images, Application of remote sensing.

WIRELESS COMMUNICATION SYSTEM: The cellular concepts Major propagation mechanisms, path loss models, shadowing models. Small-Scale fading and Multipath fading, performance of some modulation techniques in fading channels. Modulation techniques for wireless communication: Analog, Digital Modulation, and spread spectrum modulation. Equalization, Diversity, and Channel Coding Diversity techniques, Multiple access techniques for wireless communications FDMA, TDMA, and CDMA Wireless system and Standards AMPS, Global System for mobile (GSM), CDMA.

References:

- 1) Optical Fiber communication Palis Pearson Education
- 2) Optical Fiber Communication B Gupta second edition PHI
- 3) Wireless digital communications; Principles and practice. T.S.Rappaport, Pearson Education /,Prentice Hall,NJ,1996.
- 4) Mobile Communications; Schiller Pearson Education, first edition
- 5) “Satellite Communication”, Dennis Roddy PHI
- 6) Satelite Communication System Engineering W L Prichard Pearson Education.
- 7) Introduction to wireless and mobile systems A Garwal & An Zeng Vikas Tomson
- 8) Analog and digital Communication B P Lathi Oxford
- 9) Remote Sensing - Principle And Interpretation Flyod F Sabins W H Freeman & C New York
- 10) Principles of Telemetry Patranabis, Tata McGrawHill
- 11) Mobile satellite Communication D. Muples and M Rchharia Pearson Education
- 12) Wireless digital communications, K.Feher, PHI, New Delhi,1995

8 Instrumentation Lab Subject Code : **DETC-604S**
Total Marks: 100, Credit: 2 , CPW : 4
Laboratory experiments based on syllabus of **DETC/EE-601(1st Half)**

6) Control Engineering Lab Subject Code : **DEE-611S**
Total Marks: 100, Credit: 2 , CPW : 4
Laboratory experiments based on syllabus of **DETC/EE-601(2ND Half)**

7) Project-II Subject Code : **DETC-605S**
Total Marks: 200, Credit: 2 , CPW : 8

8) Grand Viva and General Skill Subject Code : **DETC-606S**

GENERIC SKILL (DCS-606S)

Total Marks: 50, Credit: 1, CPW: 2

Each class may be divided into two groups. Each group may meet once a week and discuss topics mentioned below under.

Professionalism: Professional characteristics, professional education, professional development in Industry.

Values and Ethics in Profession: Value system- goodness, means and ends; Ethics-ethical premises, expectations, conflicts and practices; Moral and ego, Ethics and morality.

Right, virtue, ethics and justice, utility and justice; Privacy, Challenges to privacy, Privacy on the Internet.

Professional Competence: Important technical topics covered in Semesters II-V as well as topics of current professional interest.

Books:

1. Ethics and Engineering ---by Martin and Schinizer, TMC.
2. Issues and Ethics—by Correy G.Correy , Brooks & Cole Pub.
3. Ethics and Professionalism ---by John Kultgen
4. Ethics and the conduct of business-- by John R.Boatright, PE.

FINAL VIVA (DETC-606S)
Total Marks : 50, Credit : 1, CPW : 2

COURSE CONTENT

The syllabi of all the theoretical and Sessional subjects taught in the 3years/ 6(six) Semesters of diploma education.

9) Object Oriented Programming Lab **Subject Code : DCS-611S**
Total Marks: 100, Credit: 2, CPW: 4

List of experiments:

PROGRAMMING WITH C++

- 1) Classes – objects – Declaring & Creating Objects – Concept of members variable, methods – Private, Public, protected variable.
- 2) Constructors: Constructor with parameter – Constructor without parameter – Copy Constructor.
- 3) Destructor.
- 4) Passing objects to method.
- 5) Inheritance: Private, Public, protected inheritance – Single, Multiple inheritance – Multilevel, hierarchical inheritance.
- 6) Operator overloading & polymorphism: Unary operator overloading like ++, -- etc. – Binary operator overloading like arithmetic operator – Comparison operator, Assignment operator etc. – Introductory problem on virtual function & friend function.
- 7) Class Templates and Exception handling.