ST.PHILOMENA'S COLLEGE (AUTONOMOUS), MYSURU

(AFFILIATED TO THE UNIVERSITY OF MYSORE)

Three-year six semesters Choice Based Credit System (CBCS) with Learning Outcome Based Curriculum framework (LOCF)
and Continuous Assessment & Grading Pattern (CAGP) Undergraduate Programme under Autonomous Structure

Programme - B.Sc.

Academic year 2018-19 onwards

DEPARTMENT OF ELECTRONICS

VISION AND MISSION OF THE COLLEGE

VISION:

The college is guided by the visionary zeal of providing value- based education to everyone irrespective of religion, caste, creed or sex by which the character is formed, intellect is explained and one can stand on his/her feet**.**

MISSION:

To transform young men and women who come to learn not from books, but also from life and to share the experience of working and playing together, this inculcates life skills to become good citizens with integrity and discipline**.**

Programme Educational Objective (PEO)

PEO-1	Graduates will be able to master and display competency and leadership to become successful professionals, employees and entrepreneurs or pursue higher education and research.
PEO-2	Graduates will be able to demonstrate the commitment towards professional ethics, gender sensitivity, preservation of environment and sustainable development.
PEO-3	Graduates will continue to learn and advance their careers through activities such as participation in professional organizations, attainment of professional certification and seeking higher education.

Programme Outcomes (PO): BSc Programme

PO-1	**Disciplinary Knowledge:** The BSc. graduates will acquire the knowledge with facts and figures related to pure and applied sciences. Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
PO-2	**Cognitive and Communicative skills:** Students learn two languages along with three major subjects. At the end of the programme, the students would have developed reading, writing, speaking, interpretive and composition skills. They would be able to communicate with others using appropriate media; confidently share one's views and express themselves
PO-3	**Research Related Skills:** The BSc. students will acquire the skills in handling scientific instruments, planning and performing in laboratory experiments.
PO-4	**Ethics**: The BSc. students will be imbibed ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.

PO-5	**Problem Solving:**The BSc. graduates will develop the ability to analyze and solve Course-related problems and also the ability to evaluate situations and react responsibly to communicate, cooperate and lead a team among peers and others.
PO-6	**Critical Thinking:** The qualities of a science student – observation, precision, analytical mind, logical thinking, clarity of thought and expression, systematic approach, qualitative and quantitative decision making are enhanced.
PO-7	**Social Interaction:** The BSc. graduates shall appreciate the role of science in society; and its personal, social and global importance.
PO-8	**Analytical Skills**: The graduates will master the skills of observations and drawing logical inferences from the scientific experiments. Analyzed the given scientific data critically and systematically and the ability to draw the objective conclusions.
PO-9	**Environment and Sustainability:** Graduates will be able to understand the issues of environment and work towards sustainable development.
PO-10	**Employability:** After completing the programme, graduates will have the competency to be employed or to be an entrepreneur.
PO-11	**Leadership Quality:** In the graduation programme students are inculcated moral and ethical values, managerial skills, adoptability, problem solving, taking initiative, decision making, risk taking to make them confident leaders.

Programme Specific Outcomes (PSO) BSc-Programme

PSO-No	After the completion of BSc programme by studying PCM/PME/PMC the students will be able to	Cognitive level
PSO-01	Develop critical thinking and skills for problem solving leading to scientific attitudes and initiate research. They will be able to develop experimental and data analysis skills through a wide range of experiments in the practical laboratory.	Apply
PSO-02	Develop analytical skills and problem solving skills required for the application of chemical principles. They will be able to perform scientific experiments skillfully by application of procedural knowledge.	Analysis

PSO-03	Integrate modern techniques (Maxima, Scilab, etc.) with the knowledge of Mathematics for solving problems in the relevant areas. They will be able to apply the acquired principles and knowledge of mathematical sciences to execute work to manage projects in multidisciplinary areas.	Evaluate
PSO-04	To understand and analyse the principles and working of different electronic systems. Thereby they will be able to offer real time and efficient solutions problems that are directly or indirectly related to Electronics and will contribute towards the development of society.	Apply
PSO-05	Identify, Analyze the computing requirements of a problem and Solve them using computing principles. They will be able to Design and Evaluate a computer based system, components and process to meet the specific needs of applications in Computer knowledge.	Analyse

Mapping of Mission of the College with PEO

Mission	PEO-1	PEO-2	PEO-3
Mission -1	✓	✓	✓

Mapping of PEOs with Programme Outcomes(PO)

PEO No.	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**
PEO-1		✓	✓		✓					✓	✓
PEO-2	✓			✓					✓		
PEO-3						✓	✓	✓			

SCHEME OF INSTRUCTION AND EXAMINATION
Discipline Specific Core (DSC)

Semester	Title of the DSC paper	Course code	Teaching Scheme (Hours per week)				Examination Scheme			
							Maximum marks			
			Theory	Practical	Credits	Duration	End Semester Theory/ Practical	IA	Total	
I	**Paper I – Analog Electronics**	MA400	3	-	3	3	50	20	70	100
	Practical Paper I – Analog Electronics Lab	MA402	-	3	1.5	3	20	10	30	
II	**Paper II – Digital Electronics**	MB400	3	-	3	3	50	20	70	100
	Practical Paper II – Digital Electronics Lab	MB402	-	3	1.5	3	20	10	30	
III	**Paper III – Linear Integrated Circuits**	MC400	3	-	3	3	50	20	70	100
	Practical Paper III – Linear Integrated Circuits Lab	MC402	-	3	1.5	3	20	10	30	
IV	**Paper IV – Transducers & Data Converters**	MD400	3	-	3	3	50	20	70	100
	Practical Paper IV – Transducers & Instrumentation	MD402	-	3	1.5	3	20	10	30	
V	**Paper V – Communication**	ME400	3	-	3	3	70	30	100	150
	Practical Paper V – Communication Lab	ME404	-	3	1.5	3	35	15	50	
	Paper VI – VHDL	ME402	3	-	3	3	70	30	100	150
	Practical Paper VI – VHDL Lab	ME406	-	3	1.5	3	35	15	50	
VI	**Paper VII – Microcontroller**	MF400	3	-	3	3	70	30	100	150
	Practical Paper VII – Microcontroller Lab	MF404	-	3	1.5	3	35	15	50	
	Paper VIII – Digital Signal Processing	MF402	3	-	3	3	70	30	100	150
	Practical Paper VIII – Digital Signal Processing Lab	MF406	-	3	1.5	3	35	15	50	

SCHEME OF INSTRUCTION AND EXAMINATION
Discipline Specific Elective (DSE)

Semester	Title of the DSE paper	Teaching Scheme (Hours per week)				Examination Scheme			
		Course code	Theory	Practical	Credits	Duration	Maximum marks		
							End Semester Theory/ Practical	IA	Total
II/III/IV	**Network Analysis**	M40Y01	2	-	2	2	30	20	50
	Advanced Solid State Devices	M40Y02	2	-	2	2	30	20	50
	Power Electronics	M40Y03	2	-	2	2	30	20	50
	Photovoltaic	M40Y04	2	-	2	2	30	20	50
V/VI	**Smart Sensors**	M40Y05	2	-	2	2	30	20	50
	Computer Organization	M40Y06	2	-	2	2	30	20	50
	Project Work	M40Y07	-	4	2	2	30	20	50
	Internship	M40Y08	-	4	2	2	30	20	50

SCHEME OF INSTRUCTION AND EXAMINATION
Skill Enhancement Course (SEC)

Semester	Title of the SEC paper	Teaching Scheme (Hours per week)				Examination Scheme			
		Course code	Theory	Practical	Credits	Duration	Maximum marks		
							End Semester Theory/ Practical	IA	Total
III/IV/V /VI	**Basics of Electricity and Electronics**	SE518	2	-	2	2	30	20	50

I SEMESTER
ELECTRONICS – I

Title: ANALOG ELECTRONICS

Paper Code: MA400 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 50 **Internal Assessment – 20** **Maximum Marks – 70**

Course Objectives:

Objective 1	To know the construction, theory and characteristics of various electronic devices
Objective 2	To emphasis on design of basic electronic circuits
Objective 3	To develop capacity to analyze and interpret different electronics circuits

Course Outcomes:

After completing the course, students will be able to:

CO1	Understand the fundamentals and working of semiconductor devices	Understand
CO2	Analyze semiconductor devices' models for different frequencies	Analyze
CO3	Design simple circuits	Apply

Unit – 1 Diode circuits and its applications 16 hours

1.1 PN junction diode characteristics and parameters.
Diode circuit analysis.

1.2 Analysis of half wave and Bridge rectifiers.

1.3 Filters: C, LC and PI.

1.4 Voltage multiplier.

1.5 Zener diode characteristics. Zener voltage regulator.
Three terminal Fixed voltage regulators - (78XX and 79XX).

1.6 Power supply: power supplies performance.

Unit – 2 BJT, UJT, FET and MOSFET 16 hours

2.1 Bipolar junction transistor CE, CB and CC characteristics.

2.2 Transistor biasing, DC load line and Q point.
Fixed bias and voltage divider bias.
Stabilization and stability factors – derivation.

2.3 UJT- characteristics and working.

UJT relaxation oscillator.

2.4 FET - construction and working, characteristics and application.

2.5 MOSFET - enhancement type and depletion type - construction, characteristics and working.

2.6 Transistor CE amplifier.
h - parameters, analysis of CE amplifier using h – paramete

2.7 FET voltage amplifier (CS configuration).

Unit – 3 Amplifier and Oscillators 16 hours

3.1 Amplifier classification, Distortion in Amplifiers.

3.2 Cascade connection- direct coupled, RC coupled and Transformer coupled amplifier.

3.3 Tuned Amplifier.

3.4 Power amplifiers:
Class A, Class B - principle, working and derivation.
Class C - principle and working.

3.5 Feedback- concepts and connection types, Effect of negative feedback on gain, stability, bandwidth, noise, distortion, input and output impedance.

3.6 Oscillator operation - Barkhausen criterion for oscillation.
RC phase shift, Wien bridge,Hartley, Colpitts and crystal oscillators.

Reference Books:

1. David A. Bell - *Electronic devices and circuit, 5th Edition, Oxford University Press.*
2. Robert. L. Boylstead and Louis Nashelsky - *Electronic devices and circuit theory 10th Edition.*
3. Dr. R. D. Sudhakar Samuel, U. D. Mahadevaswamy and V. Natarasu - *Electronic circuits, Sanguine Publications*
4. V. K. Mehta - *Principles of Electronics*

I SEMESTER
ELECTRONICS PRACTICAL – I

Title: ANALOG ELECTRONICS LAB

Paper Code: MA402	**Paper Type: DSC**	**Class duration: 3hours/Week**
End Semester Exam – 20	**Internal Assessment – 10**	**Maximum Marks – 30**

Course Objectives:

Objective 1	To acquaint with characteristics of various electronic devices
Objective 2	To lay a strong fundamental base of discrete electronics
Objective 3	To analyze and interpret results

Course Outcomes:

After completing the course, students will be able to:

CO1	Plot characteristics of semiconductor devices	Understand
CO2	Analyze frequency response curves of devices	Analyzee
CO3	Measure device and circuit performance parameters	Apply

Any Nine of the following experiments

1. Half wave and bridge rectifiers with and without Capacitor filters.
2. Zener Diode voltage regulator - line and load regulation
3 Single stage RC coupled amplifier - frequency response and bandwidth
4. FET Characteristics and determination of parameters
5. FET amplifiers - frequency response and band width
6. UJT Characteristics
7. UJT Relaxation oscillator

8. Single tuned amplifier
9. Hartley and Colpitts oscillator.
10. Diode Clippers and Clampers
11. RC Phase Shift oscillator
12. Construction of regulated DC power supply
13. Transformer less Class – B push pull power amplifier
14. Characteristics of a BJT in common emitter configuration.

II SEMESTER
ELECTRONICS – II

Title: DIGITAL ELECTRONICS

Paper Code: MB400 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 50 **Internal Assessment – 20** **Maximum Marks – 70**

Course Objectives:

Objective 1	To become familiar with the basic principles of Numbering Systems and logic gates
Objective 2	To Design combinational and Sequential Circuits
Objective 3	To have understanding of Logic Families

Course Outcomes:

After completing the course, students will be able to:

CO1	Understand fundamentals of Number Systems, Boolean algebra and minimization techniques	Understand
CO2	Design combinational and sequential digital circuits	Analyze
CO3	Understand the different Logic families and Semiconductor Memories	Understand

Unit – 1 Number system and Boolean algebra 16 hours

1.1 Binary, Octal and Hexadecimal number systems, Conversion from one system to the other.

1.2 Addition, multiplication and division in binary systems. Negative number representation. Subtraction in binary system - one's and two's complement methods.

1.3 Weighted codes: 8421, 2421, BCD addition.
Self complementary codes.
Non weighted codes: Excess 3 code and Gray code.
Alphanumeric codes: ASCII, EBCDIC, UNICODE.
Error detection and correction: Parity, CRC and Hamming code

1.4 Laws of Boolean algebra, Principle of duality, DeMorgan's theorems. Simplification of Boolean expressions.

1.5 Logic gates, Boolean expression for logic circuits and vice versa.

1.6 Universal logic gates - NAND and NOR. Realization of basic gates from Universal gates.

Unit – 2 Combinational logic circuits and IC Logic families 16 hours

2.1 SOP and POS notations. Canonical Expressions. Conversion from SOP to POS form and vice versa.

2.2 Reduction of Boolean expressions (three/ four variables with don't care conditions) using Karnaugh maps. Realization of simplified Karnaugh expressions with NAND and NOR gates.

2.3 Half Adder, Full Adder, Half Subtractor, Full Subtractor, adder/subtractor circuit.

2.4 Binary to Gray and Gray to Binary converter, Parity generator and checker, Magnitude Comparator.

2.5 Decoders, Encoders, Logic design using decoders.

2.6 Multiplexer, Demultiplexer, Logic design using Multiplexers.

2.7 Logic Families: TTL and CMOS, parameters, circuit diagram and working of NAND and NOR gates.

Unit –3 Sequential logic circuits and PLDs 16 hours

3.1 Flip flops - RS latch, clocked RS and D flip flops, JK and T flip flops, Race Round condition, Master slave JK flip flops.

3.2 Shift register - SISO, SIPO, PISO, PIPO registers, Universal shift register.

3.3 Counter - Ripple and synchronous binary counters, mod N and decade counters.

3.4 Memory - ROM RAM
Memory addressing - linear addressing, matrix addressing.
Basic memory cell, memory read and write operations.
SRAM and DRAM.

3.5 Programmable Logic Devices - PROM, PAL, PLA, CPLD, FPGA.

Reference Books:

1. Floyd and Jain- *Digital Fundamentals, Pearsons Education India*
2. Albert Paul Malvino and Donald P. Leach - *Digital Principles and applications*
3. Charles H. Roth, *Fundamentals of logic design* Thomson books / Co. publications, 5th Edition.
4. Ronald J. Tooci, *Digital Systems Principles and Applications*, PHI.

II SEMESTER
ELECTRONICS PRACTICAL – II

Title: DIGITAL ELECTRONICS LAB

Paper Code: MB402 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 20 **Internal Assessment – 10** **Maximum Marks – 30**

Course Objectives:

Objective 1	To become familiar with the use of various digital ICs
Objective 2	Get a knowledge of the operation and application of digital circuits
Objective 3	To Design combinational and Sequential logic circuits

Course Outcomes:

After completing the course, students will be able to:

CO1	Implement logical operations using basic and universal logic gates	Apply
CO2	Perform and realize arithmetic, logic circuits using gates, ICs	Apply
CO3	Execute and realize the combinational logic circuits using gates, ICs and Sequential logic circuits	Apply

Any Nine of the following experiments

1. NAND and NOR as Universal gates
2. Realization of Boolean expressions using gates.
3. Full adder and Full Subtractor.
4. Four bit parallel adder /subtractor using 7483 and 7486, BCD to Excess -3 code conversion.
5. Binary to gray and gray to binary converter, Parity generator.
6. Multiplexer and Demuliplexer.
7. Encoder and Decoder, BCD to Seven segment display decoder.
8. SR and JK Flipflop, JK Masterslave Flipflop.
9. Shift Register.
10. Modulo-n ripple and synchronous counters.

11. Study of RAM 74189.
12. Magnitude Comparator.

III SEMESTER
ELECTRONICS – III

Title: LINEAR INTEGRATED CIRCUITS

Paper Code: MC400 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 50 **Internal Assessment – 20** **Maximum Marks – 70**

Course Objectives:

Objective 1	To impart knowledge of working principles of Op-amp & its applications
Objective 2	To introduce the theoretical concepts and applications of few Special ICs
Objective 3	To design simple circuits for particular application

Course Outcomes:

After completing the course, students will be able to

CO1	Gain an understanding of op amp and its parameters	Understand
CO2	Analyze and explain the working of op-amp based circuits	Understand
CO3	Understand the importance and applications of special ICs	Understand

Unit – 1 OPAMP & its basic applications 16 hours

1.1 Introduction to Differencial amplifier.

1.2 Introduction to Op-amp: Block diagram, Ideal opamp, opamp equivalent circuit, ideal voltage transfer curve.

1.3 Opamp parameters and their measurements.

1.4 Open loop configurations - Inverting and non inverting amplifiers, limitations.

1.5 Closed loop amplifiers: virtual short, Inverting and non inverting,

1.6 Summing, Scaling and averaging amplifiers, Differential amplifier.

1.7 Instrumentation amplifier.

Unit – 2 Other Opamp applications 16 hours

2.1 Voltage to current and Current to voltage converters, Integrator, Differentiator, Log and Antilog Amplifiers.

2.2 Precision Rectifier, Clippers and Clampers.

2.3 Active Filters - first order and second order low pass and high pass Butterworth filters, Band Pass filters.

2.4 Waveform generators - phase shift oscillator, Wien bridge oscillator, Square wave and Triangular wave generators.

2.5 Comparators, Window comparator and Schmitt trigger.

Unit – 3 Additional Linear Integrated Circuits 16 hours

3.1 Voltage regulators: Series and Shunt regulators.

3.2 Adjustable IC voltage regulators – LM317 and LM337, IC 723.

3.3 SMPS

3.4 555 Timer: basic timer circuit. Astable and monostable modes of operation, applications

3.5 Phase Locked Loop - Operating principle.

Reference Books:

1. David A. Bell – *Operational amplifiers and Linear ICs,* 3rd Edition, Oxford University Press.
2. Robert F. Coughlin and Frederick F. Driscoll - *Operational amplifiers and Linear Integrated Circuits,* Prentice – Hall of India.
3. Ramakanth A. Gayakwad - *Op- amps and linear integrated circuits,* Prentice, Hall of India.

III SEMESTER
ELECTRONICS PRACTICAL – III

Title: LINEAR INTEGRATED CIRCUITS LAB

Paper Code: MC402 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 20 **Internal Assessment – 10** **Maximum Marks – 30**

Course Objectives:

Objective 1	To design and construct op amp linear circuits
Objective 2	To design and construct op amp nonlinear circuits
Objective 3	To study multi-vibrator and regulator circuits

Course Outcomes:

After completing the course, students will be able to

CO-1	Measure op-amp parameters	Apply
CO-2	Design and construct wave generator and filter circuits	Apply
CO-3	Design and construct multivibrator circuits	Understand, Apply

Any Nine of the following experiments

1. Measurement of Op-amp parameters-offset voltage, Input offset and bias current, CMRR and slew rate.
2. Inverting and Non Inverting DC and AC amplifier – gain and frequency response.
3. Op-amp adder and subtractor
4. Op-amp Differentiator and Integrator
5. Op-amp Wien bridge oscillator
6. Op-amp phase shift oscillator.
7. Op-amp triangular wave generator.
8. IC 555 Timer as a stable multivibrator.

9. IC 555 Timer as monostable multivibrator
10. First order low pass and high pass Butter worth filter
11. Voltage regulator
12. Frequency synthesis using PLL

IV SEMESTER
ELECTRONICS – IV

Title: TRANSDUCERS AND INSTRUMENTATION

Paper Code: MD400 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 50 **Internal Assessment – 20** **Maximum Marks – 70**

Course Objectives:

Objective 1	To impart knowledge on basic measurement concepts
Objective 2	To understand the working principle of various sensor
Objective 3	To understand the working of data converter circuits

Course Outcomes:

After completing the course, students will able to:

CO1	Understand a Measurement system and the characteristics of instruments	Understand
CO2	Understand the working principle of different sensors and their applications	Understand
CO3	Understand the various A/D and D/A conversion techniques	Understand

Unit – 1 **Performance Characteristics of Instruments** 16 hours

1.1 Elements of measurements system.
1.2 Instrument types.
1.3 Static and Dynamic characteristics of Instruments.
1.4 Errors - Systematic errors and their reduction, Random errors.
1.5 Signal transmission - Electrical, pneumatic and Fiber optic transmission, Radio telemetry.

Unit – 2 **Sensors** 16 hours

2.1 Capacitive, Inductive and Resistive sensors.
2.2 Hall effect sensors, Piezoelectric transducers, strain gauges, Piezo resistive sensors.
2.3 Optical sensors, Ultrasonic transducers, Nuclear sensors,
2.4 Micro sensors, Sensor network.
2.5 Intelligent Devices and Sensor Technologies

Intelligent Devices, Intelligent sensors and transmitters.

Unit – 3 Data Converters 16 hours

3.1 Sample and Hold circuits and their specifications.

3.2 Digital to Analog converters: Classification, R-2R, Weighted resistor. Current DAC, Multiplying DAC.

3.3 Current steering DAC, DAC0800

3.4 Analog to Digital converters: Classification of ADCs, Counter type, Successive approximation.

3.5 Dual slope, Voltage to frequency, Voltage to time, Flash type ADCs

3.6 Piplined ADC, DeltaSigma Converters, Converter specifications.

Reference Books:

1. Alan S. Morris - *Measurement and instrumentation Principle*s, 3rd Edition, Butterworth-Heinemann.
2. C. S. Rangan, G. R. Sharma, V. S. V. Mani - *Instrumentation - Devices and System,* 2nd Edition, Tata McGraw-Hill.
3. A. K. Sawhney - *A Course in Electrical and Electronic Measurements and Instrumentation*
4. Robert F. Coughlin and Frederick F. Driscoll - *Operational amplifiers and Linear Integrated Circuits,* Prentice – Hall of India.

IV SEMESTER
ELECTRONICS PRACTICAL – IV

Title: INSTRUMENTATION LAB

Paper Code: MD402 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 20 **Internal Assessment – 10** **Maximum Marks – 30**

Course Objectives:

Objective 1	To construct Signal Conditioning circuits
Objective 2	To construct data converter circuits
Objective 3	To become familiar with different sensors

Course Outcomes:

After completing the course, students will able to:

CO1	Measure sensor performance parameters	Understand, Apply
CO2	Design and construct signal conditioning circuits	Apply
CO3	Use A/D and D/A Converter circuits	Apply

Any Nine of the following experiments

1. Instrumentation amplifier
2. 4-bit DAC using R-2R ladder network and opamp
3. Analog to Digital converter using ADC 0801
4. Voltage to current converter
5. Voltage to frequency converter
6. Characteristics of LDR
7. Characteristics of Capacitive transducer
8. Opto coupler Characteristics
9. Implementation of Schmitt trigger op-amp for given values of UTP and LTP.

10. Thermistor Characteristics
11. Precision rectifier
12. Op-amp voltmeter
13. Sample and hold circuit
14. Response of 1^{st} order and 2^{nd} order systems

V SEMESTER
ELECTRONICS – V

Title: COMMUNICATION

Paper Code: ME400 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 70 **Internal Assessment – 30** **Maximum Marks – 100**

Course Objective:

Objective 1	To become familiar with different multiplexing and modulation techniques
Objective 2	To become familiar with demodulation techniques, Antennas and Transmission lines
Objective 3	To become familiar with Fiber optic and Satellite communication

Course Outcome:

After completing the course, students will able to:

CO1	Understand Analog and Digital Modulation Techniques	Understand
CO2	Understand Antennas and wave propagation	Understand
CO3	Understand Optical and Microwave communication systems	Understand

Unit – 1 Introduction and Modulation Techniques 16 hours

1.1 Block diagram of an electronic communication system, Modulation.
1.2 Amplitude modulation - Frequency Spectrum of AM wave, representation of AM, Power Relation, Current Calculation, Modulation by several sine waves.
1.3 AM Transmitter, transistor modulator circuit.
1.4 DSBCS, Balanced modulator.
1.5 SSB: Filter system, phase shift method
1.6 Vestigial sideband transmission.
1.7 Frequency modulation - Frequency spectrum, Band width, wideband and narrowband FM., Intersystem comparison-FM, PM and AM.
1.8 Generation of FM: Basic Reactance Modulator, Indirect Method, FM transmitter.

1.9 Phase Modulation. Comparison between AM, FM and PM.

1.10 Pulse Communication: PAM, PWM, PPM, PCM-Principles of PCM, quantizing noise, advantages and applications of PCM.

Unit – 2 Demodulation Techniques, Transmission lines and Antennas 16 hours

2.1 Radio receiver characteristics.

2.2 Super heterodyne receiver, AGC.

2.3 Diode detector, AM receiver

2.4 FM Demodulator: Slope detector, Balanced Slope detector, Phase discriminator. FM receiver.

2.5 Electromagnetic waves.

2.6 Digital Transmission: Introduction - ASK, FSK, PSK, BPSK, QPSK.

2.7 Transmission Lines: Basic Principles, Characteristics Impedance, Losses in transmission lines, standing waves, quarter and half length lines, reactance properties of transmission lines, Stub.

2.8 Antennas: Radiation mechanism, wire Radiators in space - radiation pattern and current distribution for different lengths, resonant and non resonant antennas.

2.9 Antenna parameters, antenna with parabolic reflector

Unit – 3 Modern Communication – Satellite and Fiber optics 16 hours

3.1 Satellite Communication: Introduction, Orbits, station keeping,

3.2 Satellite system – space segment, up link, down link, cross link, transponders, path loss, ground station, simplified block diagram of earth station.

3.3 Satellite access – TDMA, FDMA, CDMA concepts.

3.4 Fiber optics: block diagram, fiber types, fiber performance,

3.5 Fiber optic sources, optical detector, losses in fiber optic.

Reference Books:

1. George Kennedy and Bernard Davis - *Electronic Communication System,* 4th Edition, Tata McGraw-Hill.
2. William Schweber - *Electronic Communication System,* 3rd Edition, Prentice Hall.
3. Anil K. Mani and Varsha Agarwal - *Satellite Technology,* 2nEdition,

V SEMESTER
ELECTRONICS PRACTICAL – V

Title: COMMUNICATION LAB

Paper Code: MF404	**Paper Type: DSC**	**Class duration: 3hours/Week**
End Semester Exam – 35	**Internal Assessment – 15**	**Maximum Marks – 50**

Course Objectives:

Objective 1	To study various modulation techniques
Objective 2	To become familiar with radiation pattern
Objective 3	To measure performance parameters of a fiber optic communication system

Course Outcomes:

After completing the course, students will able to:

CO1	Demonstrate the working of Frequency and Pulse modulation circuits	Understand
CO2	Analyze the radiation pattern of a radiating system	Analyze
CO3	Measure the losses in a fiber optic communication system	Analyze

Any Nine of the following experiments

1. Narrow bandpass filter.
2. AM modulation
3. FM modulation
4. PWM using 555 IC
5. PPM using 555 IC
6. Radiation pattern of dipole antennas
7. IF amplifier
8. RF amplifier
9. Analog fiber optic link
10. Radiation pattern of LED
11. Preemphasis and deemphasis circuit
12. Frequency Mixer
13. Numerical aperture measurement and attenuation losses in fibers

V SEMESTER
ELECTRONICS – VI

Title: VHDL

Paper Code: ME402	**Paper Type: DSC**	**Class duration: 3hours/Week**
End Semester Exam – 70	**Internal Assessment – 30**	**Maximum Marks – 100**

Course Objectives:

Objective 1	To model Combinational logic circuits using HDL
Objective 2	To model Sequential logic circuits using HDL
Objective 3	To become familiar with advanced coding tools for modeling digital circuits

Course Outcomes:

After completing the course, students will able to:

CO1	Describe the circuit in Behavioral and Dataflow model	Apply
CO2	Understand the importance of Generics and package tools	Apply
CO3	Model and design circuits using procedures and functions	Apply

Unit – 1 Introduction and Behavioral Modeling 16 hours

1.1 Introduction to VHDL, Basic Language Elements: Identifiers, Data Objects, Data Types, Operators.
1.2 Entity Declaration, Architecture Body.
1.3 Behavioral Modeling: Process statement, Variable Assignment Statement, Signal Assignment Statement, Wait Statement, If Statement, Case Statement, Null Statement, Loop Statement, Exit Statement, Next Statement, Assertion Statement, Report Statement.

Unit – 2 Dataflow and structural modeling 16 hours

2.1 Dataflow Modeling: Concurrent Signal Assignment Statement, Concurrent versus Sequential signal Assignment, Selection signal assignment, Conditional Signal Assignment Statement,
2.2 Delta Delay
2.3 Block statement, Generate statement
2.4 Structural Modeling: Component Declaration, Component Instantiation, illustrations using Examples.

Unit – 3 Generics, Subprograms and Libraries 16 hours

3.1 Introduction to Generics, illustrations using examples.
3.1 Configuration: Configuration Specification, Configuration Declaration, Direct Instantiation.
3.2 Conversion Functions.
3.3 Incremental Binding.
3.4 Subprograms.
3.5 Subprograms Overloading, Operator Overloading
3.6 Signatures
3.7 Packages Declaration, Package Body
3.8 Libraries.

Reference Books:

1. J. Bhaskar - *VHDL Primer*, 3rd Edition, Pearson.
2. Douglas L. Perry - *VHDL Programming.*
3. Gaganpreeth Kaur – *VHDL*, Pearson.

V SEMESTER
ELECTRONICS PRACTICAL – VI

Title: VHDL LAB

Paper Code: ME406	**Paper Type: DSC**	**Class duration: 3hours/Week**
End Semester Exam – 35	**Internal Assessment – 15**	**Maximum Marks – 50**

Course Objectives:

Objective 1	Develop skills to model digital circuits using Hardware Description language
Objective 2	Simulation and verify the functionality of digital circuits

Course Outcomes:

After completing the course, students will able to:

CO1	Write structural, behavioral and data flow models for digital circuits	Apply
CO2	Simulate VHDL models of digital circuits using CAD tool	Apply
CO3	Analyze Timing diagrams	Apply

Any Nine of the following experiments

1. Behavioural modeling and simulation of basic gates and simple logic circuits.
2. Structural modeling and simulation of simple Boolean Expressions
3. Modeling and simulation of adders and subtractors
4. Modeling and simulation of Magnitude comparators
5. Modeling and simulation of Flip flops
6. Modeling and simulation of Shift registers
7. Modeling and simulation of Counters
8. Modeling and simulation of Encoders and decoders
9. Modeling and simulation of Multiplexers and Demultiplexers
10. Modeling and simulation of simple ALU
11. Examples using functions and procedures
12. Examples using Packages
13. Examples using generics.

VI SEMESTER
ELECTRONICS – VII

Title: MICROCONTROLLER

Paper Code: MF400 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 70 **Internal Assessment– 30** **Maximum Marks – 100**

Course Objectives:

Objective 1	To understand the architecture and instruction set of 8051 microcontroller
Objective 2	To become familiar with interfacing devices to a microcontroller
Objective 3	To develop assembly level language programming skills

Course Outcomes:

After completing the course, students will be able to

CO-1	Acquire knowledge about the Architecture, Addressing modes & instruction set of 8051	Understand
CO-2	Write the assembly language programmes	Apply
CO-3	Understand the use of hardware for interfacing	Apply

Unit – 1 Introduction, 8051 architecture and addressing modes

16 hours

1.1 Microprocessors and Microcontrollers RISC and CISC CPU architecture, Harvard and Von-Neumann CPU Architecture.

1.2 The 8051 Architecture: Introduction, Architecture of 8051, pin diagram of 8051

1.3 Memory organization, Hardware Input/ output pins, ports and circuits.

1.3 8051 Addressing Modes and Data Transfer instructions : Introduction, Addressing Modes, External data, moves, Code Memory, Read Only Data Moves/Indexed Addressing mode, Push and Pop op codes, Data exchanges, programs.

Unit – 2 Instruction set and Counter/timer programming 16 hours

2.1 Logical operations: Byte level logical operations, Bit level logical operations, Rotate and Swap operations, programs.

2.2 Arithmetic Operations: Incrementing and Decrementing, Addition, Subtraction,

Multiplication and Division, Decimal Arithmetic, programs.

2.3 Jump Operations: The jump and call instructions, Interrupts and Returns, programs.

2.4 Counter/Timer: 8051 counter/timer, Programming Timers/counters.

Unit – 3 Serial port and Interrupt programming and interfacing 16 hours

3.1 8051 interrupt structure, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication, Interrupts, and Interrupt Priority in the 8051.

3.2 8051 serial port, Programming serial communication.

3.3 8051 Interfacing and Application: External Memory Interfacing, Interfacing 8051 to ADC, DAC, Stepper Motor, 8255.

Reference Books:

1. V. Udayashankara and M.S. Mallikarjunaswamy, *8051 Micrcontroller - Hardware, Software and Applications*, Tata McGraw-Hill, 2009
2. Kenneth J. Ayala - *The 8051 Microcontroller Architecture, Programming and Applications*, PHI.
3. Muhammed Ali Mazidi and Janice Gillispie Mazidi – *The 8051 Microcontroller and Embedded System*

VI SEMESTER
ELECTRONICS PRACTICAL – VI

Title: MICROCONTROLLER LAB

Paper Code: MF404 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 35 **Internal Assessment – 15** **Maximum Marks – 50**

Course Objectives:

Objective 1	Develop Assembly level language programming Skills
Objective 2	Develop skills to interface peripherals with microcontroller

Course Outcome:

After completing the course, students will be able to

CO1	Write assembly level language codes for different applications	Apply
CO2	Program the microcontroller on chip peripherals for specific applications	Apply
CO3	Interface different devices to the microcontroller	Apply

Any Nine of the following experiments

Programming for

1. Binary addition and Binary Subtraction
2. Binary multiplication and Binary division
3. Finding the smallest and largest numbers from the given N binary numbers
4. To arrange the given numbers in ascending /descending order
5. Code conversion
6. Stepper motor control interface
7. Generate different waveforms using DAC interface
8. PWM to control speed of a DC motor
9. External ADC interface
10. Hex Key board interface
11. Timer/counter programming
12. Serial communication

VI SEMESTER
ELECTRONICS – VII

Title: DIGITAL SIGNAL PROCESSING

Paper Code: MF402 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 70 **Internal Assessment – 30** **Maximum Marks – 100**

Course Outcome:

Objective 1	To become familiar with different discrete time signals and systems
Objective 2	To learn the various transformation tools for signal and system analysis
Objective 3	To understand and realize digital filters

Course Outcomes:

After completing the course, students will be able to

CO1	Obtain and Analyze the frequency domain representation of a signal	Apply
CO2	Design and realize IIR filters	Apply
CO3	Design and realize FIR filters	Apply

Unit – 1 **Signals, systems and Z-transformation** 16 hours

1.1 Fundamentals of signals and systems: Introduction, Basic Operations on signals

1.2 Basic continuous signals, Basic Discrete-time signals, Properties of systems, convolution sum.

1.3 Z-transforms-Introduction, Definition, ROC of finite duration and infinite duration sequences, ROC and Stability, Properties of ROC,

1.4 properties of Z-transforms, Transforms of some useful sequences, solving difference equations.

1.5 Inverse Z-transforms using partial fraction expansion method.

Unit – 2 **DFT and Analog Filters** 16 hours

2.1 DFT: Introduction to DFT and FFT, Definition of DFT and its inverse

2.2 Concepts of circular shift and circular symmetry, Properties of DFT.

2.3 FFT algorithms: Radix-2 DIT-FFT, Radix-2 DIF-FFT.

2.4 Analog filters: Introduction to IIR filters: Analog Filter specifications,

classification, Butterworth and chebyshev filters

2.5 Frequency transformation.

2.6 Design of low pass Butterworth filters and Chebyshev filters

Unit – 3 Design of Digital Filters 16 hours

3.1 Digital Filters, Bilinear transformation

3.2 Analog Design using Digital filters.

3.3 FIR filters - Symmetric and anti symmetric.

3.4 Design of Linear Phase FIR filters using windows.

3.5 Direct form realization of IIR filters, Parallel realization of IIR filters.

Reference Books:

1. Proakis and Manolakis - *Digital Signal Processing, Principles algorithm and application*, Prentice Hall of India, 3rd Edition.
2. Dr. V. Udayashankara, *Modern digital signal processing*, PHI, 3rd Edition
3. S K Mitra , *Digital Signal Processing*, Mc Graw-Hill 4th Edition.

VI SEMESTER
ELECTRONICS PRACTICAL – VIII

Title: DIGITAL SIGNAL PROCESSING LAB

Paper Code: MF406 **Paper Type: DSC** **Class duration: 3hours/Week**

End Semester Exam – 35 **Internal Assessment – 15** **Maximum Marks – 50**

Course Objectives

Objective 1	Develop Programming Skills
Objective 2	Use simulation software to design and analyze various discrete time signals and systems

Course Outcome:

After completing the course, students will be able to

CO1	Determine the response of a system for different standard inputs	Apply
CO2	Design IIR and FIR filters with given specifications	Apply
CO3	Use transformation tools to analyze signals	Apply

Any Nine of the following experiments

Programming for

1. Verification of basic operations on signals.
2. Verification of system properties.
3. Finding the DFT of a given sequence using DFT equation and FFT algorithm.
4. Verification of sampling theorem.
5. Linear and Circular convolution using basic equation and DFT-IDFT method.
6. Verification of DFT properties
7. Determination of impulse response of a given system.
8. Determination of response of a given system to any arbitrary input.
9. To determine the auto correlation and cross correlation of sequences.
10. Design of simple FIR filters.
11. Design of simple IIR filters-Butterworth

II/III/IV SEMESTER

Title: NETWORK ANALYSIS

Paper Code:M40Y01 **Paper Type: DSE** **Class duration: 2hours/Week**

End Semester Exam – 30 **Internal Assessment –20** **Maximum Marks – 50**

Course Objectives

Objective 1	To learn the tools required to analyze dc and ac circuits
Objective 2	To model devices using parameters

Course Outcome:

After completing the course, students will able to:

CO1	Analyze circuits using mesh and nodal voltage methods	Apply
CO2	Use network theorems and analyze complex circuits	Apply
CO3	Model amplifier circuits using linear network parameters	Apply

Unit – 1 Basic Concepts 8 hours

1.1 Practical sources, Source transformations

1.2 Network reduction using Star – Delta transformation

1.3 Loop and node analysis With linearly dependent and independent sources for DC and AC networks

Unit – 2 Network Theorems 14 hours

2.1 Superposition Theorem

2.2 Reciprocity and Millman's theorems

2.3 Thevinin's and Norton's theorems

2.4 Maximum Power transfer theorem

Unit – 3 Resonant circuits and Two port network parameters 10 hours

3.1 Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets.

3.2 Resonant Circuits: Series and parallel resonance, frequency response of series and Parallel circuits, Q –factor, Bandwidth.

Reference Books:

1. M. E. Van Valkenburg, *Network Analysis*, PHI/Pearson Education, 3rd Edition.
2. Hayt, Kemmerly and Durbin, *Engineering Circuit Analysis*, TMH 7th Edition.

II/III/IV SEMESTER

Title: ADVANCED SEMICONDUCTOR DEVICES

Paper Code: M40Y02 **Paper Type: DSE** **Class duration: 2hours/Week**

End Semester Exam – 30 **Internal Assessment –20** **Maximum Marks – 50**

Course Objectives:

Objective 1	To understand working and the application of optoelectronic and microwave devices
Objective 2	To understand working and the application of high power semiconductor devices

Course Outcomes:

After completing the course, students will be able to:

CO1	Understand the Characteristics of semiconductor devices used in photonics	Understand
CO2	Understand the Characteristics of semiconductor devices used in microwave communication	Understand
CO3	Understand the Characteristics of semiconductor devices used in high power applications	Understand

Unit – 1 Diodes 6 hours

1.1 Heterojunction diode, Tunnel diode

1.2 PIN diode, MS diode, MIS diode

1.3 Varactor diode, CCD

Unit - 2 Transistors and Photonic Devices 14 hours

2.1 NMOS, CMOS, MESFET, HFET, Amorphous silicon devices.

2.2 LED, Injection laser, Photodiode, Phototransistor

2.3 Photoconductors, Solar cells.

Unit - 3 Power Electronic and Microwave Devices 10 hours

3.1 PNPN diodes, SCR, DIAC, TRAIC.

3.2 READ diode, IMPATT, TRAPATT, GUNN diode.

Reference Books:

1. S. M. Sze, *Physics of semiconductor devices*, Wiley Eastern, 2nd Edition.
2. A. G. Milnes, *Semiconductor devices and Integrated electronics,* Van Nostrand Reinhold co.

II/III/IV SEMESTER

Title: POWER ELECTRONICS

Paper Code: M40Y03	**Paper Type: DSE**	**Class duration: 2hours/Week**
End Semester Exam – 30	**Internal Assessment –20**	**Maximum Marks – 50**

Course Objectives:

Objective 1	To become familiar with High voltage semiconductor devices
Objective 2	To become familiar with power converters

Course Outcomes:

After completing the course, students will be able to:

CO1	Understand characteristics of power semiconductor devices	Understand
CO2	Analyze circuits with high voltage, high current semiconductor devices	Understand
CO3	Understand the working and application of AC - AC, AC - DC, DC - DC and DC - AC converters	Understand

Unit – 1 Power semiconductor devices and Controlled Rectifiers 12 hours

1.1 Types of Power Electronic circuits. Power Diodes and Transistors – Types and switching characteristics

1.2 Thyristors – Construction, operation, switching characteristics and types.

1.3 Series and Parallel operation of power devices. di/dt and dv/dt protections. Firing circuits

1.4 AC Converters: On-Off and Phase control. Single phase Half-wave ac voltage controllers.

1.5 Single - phase Bidirectional controllers with resistive and inductive loads

Unit – 2 DC Choppers 8 hours

2.1 DC Choppers: Introduction. Step-down chopper with R and RL loads. Step-up operation

2.2 Chopper Classification. Switching-Mode regulators – Buck and Boost regulators.

Unit – 3 Inverters and Power Supplies 12 hours

3.1 Inverters: Introduction. Single phase Bridge inverters. Voltage control of Single phase inverters. Current source inverters.

3.2 UPS, SMPS, Battery Systems.

Reference Books:

1. Muhammad H. Rashid, *Power Electronics – Circuits, Devices and Applications*, 3rd Edition, Pearson Education/ PHI.
2. R.S. Ananda Murthy, V. Nattarasu, *Power Electronics*, 2nd Edition Sanguine Technical Publishers.

II/III/IV SEMESTER

Title: PHOTOVOLTAICS

Paper Code: M40Y04	**Paper Type: DSE**	**Class duration: 2hours/Week**
End Semester Exam – 30	**Internal Assessment – 20**	**Maximum Marks – 50**

Course Objectives:

Objective 1	To become familiar with technology required to harness solar energy
Objective 2	To become familiar with semiconductor devices and circuits required to conversion of solar energy to electrical energy

Course Outcomes:

After completing the course, students will be able to

CO1	Understand characteristics of solar cells	Understand
CO2	Understand the working of photovoltaic modules	Understand
CO3	Understand the design aspects of a photovoltaic system	Understand

Unit – 1 Semiconductors basics and Solar cells 10 hours

1.1 Semiconductors as solar materials, generation of carries and recombination of carriers.

1.2 Solar Cells: Introduction to P-N junction –equilibrium condition, non-equilibrium condition, P-N junction under illumination: solar cell.

Unit – 2 Design of Solar Cells and Solar Photovoltaic modules 16 hours

2.1 Upper limits of Cell Parameters, losses in solar cells, solar cell design,

2.2 Design of High Isc, Voc and FF. analytical techniques.

2.3 Solar PV modules from solar cells, mismatch in series connection, mismatching in parallel connection, PV module power plants.

Unit – 3 Photovoltaic system design 6 hours

3.1 Introduction to Solar PV systems, design methodology of PV systems,

3.2 Hybrid PV systems, grid-connected PV systems.

Reference Books:

1. Chetan Singh Solanki, *Solar Photovoltaics, Fundamentals, technologies and applications,* 2nd Edition, PHI
2. Stuart R Wenhem, *Applied Photo voltaics,* earth scan.

V/VI SEMESTER

Title: SMART SENSORS

Paper Code: M40Y05	**Paper Type: DSE**	**Class duration: 2hours/Week**
End Semester Exam – 30	**Internal Assessment – 20**	**Maximum Marks – 50**

Course Objectives:

Objective 1	To study the central elements in the design of communication protocols for the WSNs
Objective 2	To associate, hardware platforms and software frameworks used to realize dynamic WSN

Course Outcomes:

After completing the course, students will be able to:

CO1	Assess the communication protocols used for a real time WSN application	Understand
CO2	Understand the routing protocols function and their implications on data transmission delay and bandwidth	Understand
CO3	Understand the hardware & software aspects of implementing wireless sensor networks in day to day life	Understand

Unit – 1 Basics of Smart Sensors 10 hours

1.1 Introduction, Mechanical-Electronic transitions in sensing, Smart Sensor Model

1.2 Sensing Technologies: Capacitive, Piezoresistive, Hall Effect, Chemical

1.3 Digital Output Sensor: Incremental Optical Encoder, Digital Techniques

Unit – 2 Sensor Signal Conditioning and Control 11 hours

2.1 Introduction, SLEEPMODE^{TM}, , Switched Capacitor Amplifier

2.2 Operational Amplifiers, Rail – to – Rail Operational Amplifiers

2.3 4 – to 20 mA Signal Transmitter, Separate vs Integrated Signal Conditioning

2.4 Analog to Digital Converter: ΣΔ ADC

2.5 MCU control, Modular MCU Design, DSP control

Unit – 3 Protocols and Standards for Smart Sensors 11 hours

3.1 Introduction, CAN protocol, CAN Module, Neuron Chips, MCU Protocols,

3.2 IEEE 1451 working relationship, IEEE 1451.1, IEEE 1451.2, IEEE P1451.3, IEEE P1451.4.

Reference Books

1. Randy Frank, *Understanding Smart Sensors,* 2nd Edition, Artech House Publications.
2. Gerard Meijer, *Smart Sensor Systems,* Wiley

V/VI SEMESTER

Title: COMPUTER ORGANISATION

Paper Code: M40Y06	**Paper Type: DSE**	**Class duration: 2hours/Week**
End Semester Exam – 30	**Internal Assessment - 20**	**Maximum Marks – 50**

Course Objectives:

Objective 1	To introduce performance parameters of a Computer
Objective 2	To introduce various concepts related to Parallel Processing
Objective 3	To highlight the various architectures used in modern processors

Course Outcomes:

After completing the course, students will be able to:

CO1	Distinguish between CISC and RISC design philosophies	Understand
CO2	Explain the design considerations of Processor, Memory and I/O in Computer systems	Understand
CO3	Understand the importance of pipelining	Understand

Unit – 1 Basic Structure of Computer and CPU 10 hours

1.1 Basic structure of computers: Functional units, operational concepts.

1.2 CPU: data path, microoperations on datapath, control signals.

1.3 Addressing modes. Execution of instructions, fetch cycle, execution cycle. ALU and bit sliced ALU.

Unit – 2 Interrupts and Control unit 11 hours

2.1 Interrupt cycle – interrupt servicing, sources, priorities.

2.2 Controller design: control transfer, instruction interpretation and execution: Hardwired control unit and microprogrammed control unit.

2.3 CPU-Memory interaction, semiconductor memory: static memory cell,

dynamic memory cell

2.4 ROM. Memory Hierarchy: Cache memory and address mapping.

2.5 Virtual memory: logical and physical address, address translation.

Unit – 3 Input output Processing 11 hours

3.1 Data transfer techniques, bus interface – parallel and serial I/O interface

3.2 I/O data transfer – programmed I/O and DMA

3.3 I/O interrupt – polling, vectored interrupt and interrupt handling.

Reference Books

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, *Computer Organisation*,TMH, 5/e

2. J.P. Hayes, Computer Organization and Architecture, PHI

V/VI SEMESTER

Title: PROJECT WORK

Paper Code: M40Y07	**Paper Type: DSE**	**Class duration: 4 hours/Week**
End Semester Exam – 30	**Internal Assessment – 20**	**Maximum Marks – 50**

Course Objectives:

Objective 1	To apply the knowledge of mathematics and electronics to solve real world problems

Course Outcomes:

After completing the course, students will be able to

CO1	Identify research areas in the field of electronics	Apply
CO2	Compare and contrast the several existing solutions for a problem	Apply
CO3	Formulate and propose a plan for creating solutions for specific applications	Apply

In this practical course, each group consisting of a maximum of four students is expected to design a project coming under allied areas of electronics and with practical applications. The basic concepts of product design may be taken into consideration while designing the project. Literature survey is to be carried out as part of project finalization/design. The project may be implemented using software, hardware, or a combination of both. The student is expected to complete the project work assigned to him/her and submit the project report by the end of semester. Students shall submit the duly certified report.

1.	Novelty and Presentation	10 marks
2.	Demonstration and Result	10 marks
3.	Viva voce	10 marks
	Total	30 marks

V/VI SEMESTER

Title: INTERNSHIP

Paper Code: M40Y08 **Paper Code: M40Y08**

End Semester Exam – 30 **Internal Assessment – 20** **End Semester Exam – 50**

Course Objectives:

Objective 1	To provide an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting

Course Outcomes:

After completing the course, students will be able to

CO1	Gain practical experience within the industry environment	Apply
CO2	Acquire knowledge of the industry in which the internship is done	Apply
CO3	Apply knowledge and skills learned in the classroom in a work setting	Apply

An Internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks.

The internship will provide students with the opportunity to

- Gain practical experience within the industry environment
- Acquire knowledge of the industry in which the internship is done
- Apply knowledge and skills learned in the classroom in a work setting
- Develop a greater understanding about career options while more clearly defining personal career goals
- Develop and refine oral and written communication skills
- Identify areas for future knowledge and skill development

The evaluation for the internship experience is based on the presentation and report

III/IV/V/VI SEMESTER

Title: Basics of Electricity and Electronics

Paper Code: SE518	**Paper Type: SEC**	**Class duration: 2 hours/Week**
End Semester Exam – 30	**Internal Assessment - 20**	**Maximum Marks – 50**

Course Objectives:

Objective 1	To become familiar with various electrical and electronic components
Objective 2	To understand few basic electrical systems

Course Outcomes:

After completing the course, students will be able to:

CO1	Understand the different voltage and current forms	Understand
CO2	Understand the working of basic electronic components	Understand
CO3	Understand the importance of earthing and domestic wiring	Understand

Unit – 1 Basics of Electricity 15 hours

1.1 Voltage, current – types, power, electrical energy

1.2 Resistors, Potentiometers, Capacitors, Inductors

1.3 Transformer, relay, fuse

1.4 Ohm's law, resistors in series and parallel, simple circuit analysis

1.5 Switches, connectors, wires

1.6 Diode, LED, photodiode, Transistor

Unit – 2 Basics of Electronics 15 hours

2.1 Battery

2.2 Regulated dc power supply, UP

2.3 Display devices – seven segment, dot matrix

2.4 Amplifier, comparator

2.5 Basic communication system

2.6 Earthing, domestic wiring

2.7 Base 2 number system, basic logic gates

2.8 Basic memory device

Reference Books

1. Basic Electronics – Bernard Grob