

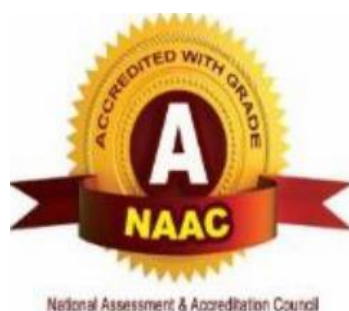


PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING, NAGPUR

**An Autonomous Institute Affiliated to RTM, Nagpur University, Nagpur
Accredited with Grade “A” by NAAC**

**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING/
ELECTRONICS & TELECOMMUNICATION ENGINEERING**

Scheme and Syllabus of Multidisciplinary Minor Courses (As Per NEP)



Engineering Program - One Major, One Minor

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Abbreviations

BSC	Basic Science Course
ESE	Engineering Science Course
PCC	Program Core Courses
PEC	Program Elective Course
MDM	Multidisciplinary Minor
OE	Open Elective
VSEC	Vocational Skill and Skill Enhancement Course
VSC	Vocational Skill Courses
SEC	Skill Enhancement Courses
AEC	Ability Enhancement Courses
IKS	Indian Knowledge System
VEC	Value Education Course
OJT	On Job Training: Internship / Apprenticeship
FP	Field Project
CEP	Community Engagement Project
CC	Co-curricular Courses
RM	Research Methodology
RP	Research Project
LLC	Liberal Learning Course
HSSM	Courses on Humanities, Social Science, and Management
SEE	Semester End Examination
CIE	Continuous Internal Evaluation



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Basket of Multidisciplinary Minor Courses offered by Electronics & Communication / Electronics & Telecommunication as per NEP

Sr. No.	Semester	Course Code	Course Name	Hours/Week			Credits	Maximum Marks			Min. Passing Marks			ESE Duration (Hrs.)
				L	T/A	P		Continuous Evaluation	End Sem Exam	Total	Continuous Evaluation	End Sem Exam	Total	
1	III	EC303T/ ET303T	Fundamentals of Electronics	2	--	0	2	20	30	50	--	8	23	2
2	IV	EC404T/ ET403T	Digital Electronics	2	--	0	2	20	30	50	--	8	23	2
3	V	EC505T/E T503T	Fundamentals of Programmable Systems	3	--	0	3	40	60	100	---	15	45	3
4	V	EC505P/E T503P	Fundamentals of Programmable Systems Lab	0	---	2	1	25	25	50	---		25	---
5	VI	EC606T/ ET603T	Basics of Communication System	2	--	0	2	20	30	50	---	8	23	2
6	VII	EC703T/E T703T	Sensors & Systems	2	--	0	2	20	30	50	---	8	23	2
7	VIII	EC805T/E T803T	IoT Fundamentals	2	--	0	2	20	30	50	---	8	23	2
Total				13	--	2	14			400				

Note: MDM subjects are to be opted by other departmental students, i.e. Other than Electronics & Communication /Electronics & Telecommunication Engineering students.)



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Department of Electronics & Communication Engineering B.Tech. III Semester Syllabus

MDM 1 : FUNDAMENTALS OF ELECTRONICS

Subject Code: EC303T	Subject : Fundamentals of Electronics
Teaching Scheme: BTECH/EC/NEP-25/R0	Examination Scheme:
Total Credit: 02	Theory (E): 30 Marks & T(I): 20 Marks
Theory: 2 Hrs./Week	Duration of End Semester Exam (ESE): 2Hrs.

Course Objectives:

1.	To study the basic electronic components and use of electronics in different fields
2.	To learn basic principle, characteristics and behavior of Semiconductor Diodes and its applications.
3.	To study the working, characteristics and behavior of BJT and its applications.

Course Outcomes: At the end of the course the students will able to

CO1	Explain the basic concept of electronic components.
CO2	Describe the concept of Semiconductor diode
CO3	Demonstrate the basic concept of BJT and FET

UNIT I:

(8 Hours) (10 Marks)

Brief History of Electronics, Use of Electronics in Different Fields, Various Electronics Components: Resistor, Capacitor, Inductor, Current and Voltage Sources, Symbol and Graphical representation, Overview of AC, DC, Cells and Batteries, Energy and Power, soldering iron and its use.

UNIT II:**(8 Hours) (10 Marks)**

Semiconductor materials, Metals and Semiconductors N-type and P-type semiconductor, Effects of temperature on Conductivity of semiconductor. PN junction diode, Forward & Reverse bias, V-I Characteristic, Zener diode, Photo diode, LED, applications of diode as a rectifier, Half wave and full wave rectification, Zener diode as a Regulator. Introduction to Filters, Clippers, Clampers

UNIT III:**(8 Hours) (10 Marks)**

Applications of transistors, its types and Operation, Biasing of BJT, CB, CE and CC configuration, Introduction to FET, JFET, MOSFET, Comparison between BJT and FET, and FET and MOSFET Applications of Transistor as Amplifier and Switch.

List of Books:**Text books:**

- 1) "Electronic Devices and Circuits", "Millman Halkias", "TMH", 2000
- 2) "Electronic devices and circuits ", "Salivahanan, Suresh Kumar, Vallavaraj", Mc Graw Hill.

Reference books:

1. "Electronic Devices and Circuits", "David A. Bell", "PHI", 4th Edition
2. " Principles of Electronic devices and Circuit Theory", "B. L. Theraja", "S. Chand",
3. "Electronic devices and Circuits-I and II", "A. P. Godse", "Technical Publications", 3rd Edition



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Department of Electronics & Communication Engineering B.Tech. IV Semester Syllabus

MDM 2 : DIGITAL ELECTRONICS

Subject Code: EC404T	Subject : Digital Electronics
Teaching Scheme: BTECH/EC/NEP-25/R0	Examination Scheme:
Total Credit: 2	Theory (E): 30 Marks & T(I): 20 Marks
Theory: 2 Hrs./Week	Duration of End Semester Exam (ESE): 2 Hrs.

Course Objectives:

1.	To learn basic principles of digital systems and its use in various fields of engineering.
2.	To familiarize with various combinational circuits, its applications in day-to-day life.
3.	To study various sequential circuits and its use in various electronics appliances and its applications.

Course Outcomes: On completion of this course, students will be able to

CO1:	Explain Logic gates, Boolean algebra, DeMorgan's Theorem to build various digital system.
CO2:	Design basic combinational circuits and realize it for given application.
CO3:	Understand the concept of sequential circuits.

Unit I: Introduction to Digital Circuit and logic Devices

(8 Hours)(10 Marks)

Need of Digital System in various fields, Analog circuit vs Digital Circuit, Applications of digital circuits in various fields of Engineering. Number System and conversions, Boolean Algebra, D-Morgan's Laws, Logic Gates, Introduction to K-map.

Unit II : Introduction to Combinational Circuit

(8 Hours)(10 Marks)

Need of combinational circuits in other fields, Concept of Combinational Circuit, Arithmetic Circuits: Adders and subtractor, Multiplexers, Demultiplexers, Encoders & Decoders. Applications of combinational circuits in home appliances.

Unit III: Introduction to Sequential Circuit

(8 Hours)(10 Marks)

Introduction to Sequential Circuits, Need of sequential circuits in other fields Latches and flipflops, Edge & Level triggered Flipflop, types of flipflop, Counters, Registers, Applications of sequential circuits in home appliances.

Text Books:

1. Morris Mano : “ An approach to digital Design”, Pearson Publications.
2. W. Fletcher : “Engg. Approach to Digital Design”, PHI Publications.

Reference Books

1. Wakerly Pearson : “Digital Design: Principles and Practices”, Pearson Education Publications.
2. R.P. Jain : “Modern digital electronics”



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Department of Electronics & Communication Engineering B.Tech. V Semester Syllabus

MDM 3 : FUNDAMENTALS OF PROGRAMMABLE SYSTEMS

Subject Code: EC505T	Subject : Fundamentals of Programmable Systems
Teaching Scheme: BTECH/EC/NEP-25/R0	Examination Scheme: 100M
Total Credit: 03	Theory (E): 60 & TH (I): 40
Theory: 3 Hrs./Week	Duration of End Semester Exam (ESE): 3Hrs.

Course Objectives:

1.	To Understand the basic concept of programmable system and its application in various fields.
2.	To learn General purpose system and Embedded systems and its use.
3.	To study functional blocks of Microprocessor and Microcontroller and its use.
4.	To study interfacing of Memory, LCD, LED, Keypad, Motors with Microcontrollers.
5.	To demonstrate working of realtime Microprocessor and Microcontrollers based systems.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

CO1	Analyse programmable system and its functionality.
CO2	Understand the basic architecture of Microprocessor & Microcontrollers
CO3	Differentiate between General purpose system and Embedded systems.
CO4	Demonstrate the working of Microprocessor and microcontrollers based system
CO5	Interfacing memory and IO devices with Microcontrollers.

Unit I: Introduction to Programmable System and Its Applications (8 Hours)(12 Marks)

Fundamentals of programmable systems, General purpose system and Embedded systems Applications of Programmable systems in various fields, Concept of Microprocessor based system, Functions of Address, Data and control Bus, Difference between microprocessor and Microcontroller. processors architectures (Von-Neuman, Harvard, Super Harvard), Applications of Microprocessor and microcontroller.

Unit II: Microprocessor based system & its Programming**(8 Hours)(12 Marks)**

Introduction of Microprocessor 8085 Architecture, Functions of ALU, Registers, Flags, Interrupts, ISR and other Onchip peripherals, Memory Organization and Memory interfacing concept with Microprocessor, Introduction to Assembly programming, Concept of Opcode and Operand, Addressing Modes, Basic 8085 Assembly Programming examples.

Unit – III: Microcontroller based system and its Programming**(6 Hours)(12 Marks)**

Introduction of 8051 Microcontroller block diagram, Internal Memory, SFR, Ports, concept of Timers, UART, Addressing Modes, Basic Assembly Programming of 8051.

Unit – IV: IO interfacing with Microcontroller**(6 Hours)(12 Marks)**

Interfacing and programming of LED , Switch, 7 segment display, DC motor, Stepper motor, keypad, 16x2 LCD display, ADC and DAC with 8051 etc.

Unit – V: Embedded system and Open Source Microcontroller Boards**(8 Hours)(12 Marks)**

Introduction to Embedded system design, Characteristics, Applications, Design challenges, CISC and RISC processors, Processor selection criteria, Case study of Realtime embedded system. Introduction to Arduino, NodeMCU board and Its programming application.

Text Books:

1. Microprocessor Architecture, Programming and Application with the 8085, Ramesh S. Gaonkar, Penram International Publishing, Mumbai, (2011).
2. Fundamental of Microprocessor 8085: Architecture Programming, and Interfacing, V. Vijayendran, Viswanathan, S., Printers & Publishers Pvt. Ltd (2009).
3. M.A. Mazidi & J.G. Mazidi, the 8051 Microcontroller and Embedded system, 3rd Indian reprint, Pearson Education.
4. The 8051 Microcontroller: Architecture, Programming, and Applications, Kenneth Ayala
5. Arduino Cookbook, Michael Margolis, O'Reilly Media, Inc., 1st Edition

Reference Books:

1. Microprocessor Organisation and Architecture, Leventhal L.A , Prentice Hall India
2. Fundamentals of microprocessors and microcomputers - Dhanpat Rai Publications, New Delhi
3. Microcontrollers: Principles And Applications, Pal Ajit, EEE, PHI, New Delhi. (Latest edition). J. Thomson Delmar learning, (latest Edition) .
4. Adventures in Arduino 1st Edition, by Becky Stewart, Wiley Publication.
5. Exploring Arduino: Tools and Techniques for Engineering Wizardry 2nd Edition, by Jeremy Blum, Wiley Publication.
6. The 8051 Microcontrollers: Architecture, Programming and Applications, Rao Dr. K Uma, Pearson Education India, New Delhi, (Latest edition).
7. Embedded Systems- Architecture, Programming and Design | 3rd Edition, Raj Kamal, Tata McGraw Hill Education



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Department of Electronics & Communication Engineering B.Tech. V Semester Syllabus

Fundamentals of Programmable Systems Lab

Subject Code: EC505P	Subject : Fundamentals of Programmable Systems Lab
Teaching Scheme: BTECH/EC/NEP-25/R0	Examination Scheme:
Total Credit: 01	Theory (E): 25 Marks & T(I): 25 Marks
Theory: 02 Hrs./Week	Duration of End Semester Exam (ESE): 3 Hrs.

Course Objectives:

1.	To perform a practicals on 8085 and 8051.
2.	To understand assembly language programming skills.
3.	To Interface different peripherals with microcontroller with its use

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1.	Demonstrate the concept of Assembly languages structure and programming for 8085 and 8051.
2.	Interface various peripherals with 8051.
3.	Interpret the programs on different software platforms.

List of Experiments

1.	Write and execute 8085 assembly program for basic arithmetic operations.
2.	Write and execute 8085 assembly program for basic logical operations.
3.	Write and execute 8085 assembly program for counting 1 and 0 of data byte.
4.	Write and execute 8051 assembly language program to perform arithmetic operations.
5.	Write and execute 8051 assembly language program to perform bitwise operations.
6.	Write and execute an ALP for 8051 to exchange the data of two memory location.
7.	Write an ALP for 8051 to finding the smallest and largest number from given data bytes

	stored in internal/external data memory location.
8.	Write and execute ALP for 8051 to convert two-digit decimal number present in external data memory into its equivalent ASCII code.
9.	Write and execute ALP for 8051 to convert two-digit decimal numbers present in external data memory into its equivalent ASCII code.
10.	Write and execute ALP for 8051 to swap nibbles of 10 bytes present in external data memory.
11.	Write and execute 8051 assembly language program to generate square wave of 1 KHz (and any other frequency) on one of the pin of output port.
12.	Interfacing and Programming of LED with 8051.
13.	Interfacing and Programming of switch with 8051.
14.	Interface 8 LEDs with 8051 and write a program to glow alternate LEDs. Modify the experiment further to blink an LED lamp of 230V AC/10W with an on and off time of 1 Second
15.	Interface microcontroller 8051 with LCD display and display a string of “Welcome to microcontroller Programming” and a table of 5
16.	Interface seven segment display with microcontroller 8051 and generate all numbers from 0 to 9 with a time duration of 1 second.
17.	Interface Microcontroller 8051 with DAC and generation of triangular wave of frequency 10kHz triggering through timer (on chip timer)
18.	Design a Stepper Motor Controller Using 8051 Microcontroller. Rotate this motor with an RPM of 150 both in clockwise and anticlockwise directions
19.	Design Water level indicator and Controller system using 8051.
20.	To study various Arduino boards
21.	Interfacing and LED and switch to Arduino board and write a program for LED control using switch.
22.	To Interface and program 7 segment display with Arduino.
23.	Interfacing and programming of various sensors and actuators with Arduino



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Department of Electronics & Communication Engineering B.Tech. VI Semester Syllabus

MDM 4: BASICS OF COMMUNICATION SYSTEMS

Subject Code: EC606T	Subject : Basics of Communication System
Teaching Scheme: BTECH/EC/NEP-25/R0	Examination Scheme:
Total Credit: 2	Theory (E): 30 Marks & T(I): 20 Marks
Theory: 2 Hrs./Week	Duration of End Semester Exam (ESE): 2 Hrs.

Course Objectives:

1.	To study the basic concept of communication and different modulation system based on basic parameters.
2.	To study the concept of noise, properties & its effects.
3.	To study the AM, FM, PM process & compute modulation Index.
4.	To study the fundamentals of AM and FM Receivers.
5.	To develop knowledge about fundamentals of Broadband Communication Systems.

Course Outcomes: At the end of the course the students will able to

CO1	Demonstrate a basic understanding of the term bandwidth and its application in communications.
CO2	Describe quantizing and PCM signals, bandwidth and bit rate calculations, study amplitude and angle modulation and demodulation of analog signals etc.
CO3	Solve the problems involving bandwidth calculation, representation & Generation of an AM sine wave
CO4	Compare different modulation techniques of Generation of FM
CO5	Identify, formulate & solve communication-engineering problems.

UNIT I: Basic Of Electronics Communication

(8 Hours) (10 Marks)

The elements of basic electronics communication system, electromagnetic spectrum, transmission mode: - simplex, half-duplex, full duplex. Sources of noise, Signal to noise ratio.

UNIT II: AM and FM Modulation and Demodulation:

(8 Hours) (10 Marks)

Need of Modulation, Types of modulation, AM modulation: - modulation index, bandwidth, types of AM. Super heterodyne Receiver, AM Demodulation: diode detector, FM modulation: - modulation index, bandwidth, types of FM. FM receiver and its working with waveforms, Introduction of pulse modulation.

UNIT III: Antenna and wave propagation

(8 Hours) (10 Marks)

Concept of propagation of radio waves, introduction to ground wave propagation, sky wave propagation, space wave propagation, Antenna fundamentals, antenna parameters, types of antennas: dipole antenna, loop antenna, Telescopic, Yagi-Uda, dish antenna, horn antenna, rectangular and circular antenna. Introduction to digital communication.

List of Books:

Text Books:

1. Kennedy & Devis : Electronic Communication Systems , Tata McGraw Hills Publication(Fourth Edition)
2. Dennis Roddy & Coolen - Electronic Communication, PHI (Fourth Edition)
3. B. P. Lathi: Modern Digital and Analog. Communication Systems: Oxford Press Publication (Third Edition)

Reference Books:

1. Simon Haykin: Communication Systems, John Wiley & Sons (Fourth Edition)
2. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill
3. Leon W.Couch, II: Digital and Analog Communication Systems, Pearson Education
(Seventh Edition)
4. Electronic Communication Systems, Roy Blake, CENGAGE Learning.



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Department of Electronics & Communication Engineering B.Tech. VII Semester **Syllabus**

MDM5 : SENSORS AND SYSTEMS

Subject Code: EC703T	Subject : Sensors & Systems
Teaching Scheme: BTECH/EC/NEP-25/R0	Examination Scheme:
Total Credit: 2 (L)	Theory (E): 30 Marks & T(I): 20 Marks
Theory: 2 Hrs./Week	Duration of End Semester Exam (ESE): 2 Hrs.

Course Objectives:

1.	To understand basic working principle of various sensors and its use in day to day life.
2.	To elaborate the theoretical and practical aspects of sensors, actuators, motors and its applications in various fields.
3.	To illustrate different types of sensors, actuators and motors used in robotics field.

Course Outcomes:

CO1	To understand the concept of sensors and systems.
CO2	Explain and analyze the physical and technical base of sensors and actuators.
CO3	Interpret the acquired information and Evaluate the performance characteristics of different types of sensors.

UNIT I: Basics of Sensors:

(8 Hours) (10 Marks)

Introduction- Principle, Classification of Sensors, Types of sensors: LDR sensors, Magnetic Sensors: Hall Effect Sensors, Magnetometer, Proximity sensors: Inductive & Capacitive, Pressure Sensors, Temperature Sensors.

UNIT II: Actuators and Motors

(8 Hours) (10 Marks)

DC Motor, AC Motor, Stepper Motor. Classification of actuators, Linear and Latching Solenoid Actuators, Pneumatic and Hydraulic actuation Systems, Rotary Actuators. Mechanical aspects of motor selection, Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches.

UNIT III: Application of Sensors in Robotics

(8 Hours) (10 Marks)

Infrared sensors for obstacle detection, Force sensor for gripping force control, Encoders for position feedback in robotics joints, Directional Control valves, Pressure control valves, Cylinders, Servo and proportional control valves, Process control valves. Types of motion, Kinematic chains, Gears, Ratchet and pawl, Belt and chain drives, Bearings.

List of Books:

Text books:

1. Andrzej M. Pawlak, "Sensors and Actuators in Mechatronics, Design and Applications", Taylor & Francis Group 2006.
2. D. Patranabis, "Sensors and Transducers", PHI Learning Private Limited.

Reference books:

1. Sensors and Signal Conditioning Wiley-Blackwell, 2008 Jacob Fraden, Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
2. W. Bolton, "Mechatronics", Pearson Education Limited.



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Department of Electronics & Communication Engineering B.Tech. VIII Semester Syllabus

MDM6 - IOT Fundamentals

Subject Code: EC805T	Subject : IOT Fundamentals
Teaching Scheme: BTECH/EC/NEP-25/R0	Examination Scheme: 50
Total Credit: 02	Theory (E): 30 Marks & T(I): 20 Marks
Theory: 2 Hrs./Week	Duration of End Semester Exam (ESE): 2 Hrs.

Course Objectives:

1.	To understand the fundamentals of Internet of Things, its applications and use in smart city.
2.	To learn about the basics design of IOT and M2M system
3.	To understand the concept of Internet of Things in the real world scenario for data collection, monitoring, controlling etc.
4.	To understand case study on any real time IOT application

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

CO1	Explain the basic concept of IoT and its applications
CO2	Understand the real world design constraints and challenges of IOT
CO3	Describe the IOT architecture.
CO4	Illustrate the real world IOT applications

Unit I: Introduction to IOT

(8 Hours) (10 Marks)

IoT definition & Characteristics, Applications on IOT in smart city, Industry, Environment etc, IoT functional blocks, IOT enabling technologies, Real-World Design Constraints and Challenges in IOT.

Unit II: IOT system Design

(8 Hours) (10 Marks)

Physical design of IoT, Logical design of IoT, IOT architecture, M2M communication system, IOT communication models (Request & Response, Push-Pull Model, Publisher-Subscriber, Exclusive Pair) IOT protocols Bluetooth, ZigBee, Wi-Fi, MQTT, IPv6, IOT design principles and capabilities,

Unit III: Case study IOT applications

(8 Hours) (10 Marks)

Introduction to NODEMCU and Raspberry Pi board, Sensors and Actuators, Case study of IOT in Home, Environment, Agricultural, transport, business, Industry applications.

List of Books :

Text Books:

1. "Internet of Things - A Hands-on Approach", Arshdeep Bahga and Vijay Madisetti, 1 st Edition, 2015, Universities Press.
2. "The Internet of Things: Key Applications and Protocols", Olivier Hersent, David Boswarthick, Omar, Elloumi, 2011, 2 nd Edition, Willy Publications.

Reference Books

1. Internet of Things – From Research and Innovation to Market Deployment Peter Friess", 2014, River, Publishers.