

**Deccan Education Society's
FERGUSSON COLLEGE (AUTONOMOUS),
PUNE**

**Syllabus
for**

**S. Y. B. Sc. (Electronics)
for Computer Science**

[Pattern 2019]

(B.Sc. Semester-III and Semester-IV)

from Academic Year

2020-21

Deccan Education Society's
Fergusson College (Autonomous), Pune

S.Y. B.Sc. (Electronics) for Computer Science (Pattern 2019)

From academic year 2020-21

Particulars	Name of Paper	Paper Code	Title of Paper	No. of Credits
S.Y. B.Sc. Semester III	Theory Paper - 1	ELC2301	Microcontroller	2
	Theory Paper - 2	ELC2302	Digital Communication	2
	Practical Paper - 1	ELC2303	Electronics Practical III	2
S.Y. B.Sc. Semester IV	Theory Paper - 3	ELC2401	Single Board Computer	2
	Theory Paper - 4	ELC2402	Wireless Communication	2
	Practical Paper - 2	ELC2403	Electronics Practical IV	2

S.Y. B.Sc.(Electronics) Semester III**Subject: Electronics Paper -1 (ELC2301) Paper title: Microcontroller****[Credits-2]****Course Outcomes**

At the end of this course, students will be able to

- CO1** Understand Architecture of Intel 51 family Microcontroller.
CO2 Interface I/O devices to Microcontroller.
CO3 Acquire a skill of writing assembly / C language programs.
CO4 Understand Serial communication using Microcontroller.

Unit	Details	Lectures
I	Basics of Microcontroller & Intel 51 family architecture Introduction to microcontrollers, difference in controller and processor. Architecture of 8051, Internal block diagram, Internal RAM organization, SFRS, pin diagram of 8051, I/O ports structure & operation, External Memory Interface.	[08]
II	Assembly language Programming Instruction classification, Instruction set, Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives - features with example, I/O Bit & Byte programming using assembly language for LED and seven segment display (SSD) interfacing.	[10]
III	Timer / Counter, Serial communication, Interrupts TMOD, TCON, SCON, SBUF, PCON Registers, Timer modes, programming for time delay using mode1 and mode2. Introduction to interrupt, Interrupt types and their vector addresses, Interrupt enable register and interrupt priority register(IE,IP), Synchronous and asynchronous serial communication.	[12]
IV	I/O Interfacing Introduction 8051 programming in C, Programming serial port without interrupt, Use of timer to select baud rate for serial communication. Interfacing ADC, DAC, LCD, stepper motor.	[06]
Reference Books	<ol style="list-style-type: none"> 8051 microcontroller and Embedded system using Assembly and C - Mazidi, Mazidi and McKinley, Pearson Education, 2nd Edition 2008. The 8051 microcontroller – Architecture, programming and applications: K.UmaRao and AndhePallavi, Pearson publications, First Edition 2010. Programming and Customizing the 8051 Microcontroller – MykePredko, Tata McGraw-Hill Publishing Company Ltd, Tata McGraw-Hill Edition 1999 	

E-Resources	https://www.pdfdrive.com/the-8051-microcontroller-architecture-programming-and-applicationspdf-e34376223.html	
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S.Y. B.Sc.(Electronics) Semester III

Subject: Electronics Paper -2 (ELC2302), Paper title: Digital Communication

[Credits-2]

Course Outcomes

At the end of this course, students will be able to

- CO1** Acquire knowledge of basic communication systems.
- CO2** Understand various Modulation, Multiplexing and Multiple access techniques.
- CO3** Apply various communication theorems to evaluate parameters like bandwidth, SNR etc.
- CO4** Know basics of Communication Network models.

Unit	Details	Lectures
I	Introduction to Electronic Communication Elements of Communication system, Electromagnetic spectrum, Serial and Parallel transmission. Modes of communication: asynchronous and synchronous, Data transmission modes: simplex, half duplex and full duplex, Concepts of communication system: Signal bandwidth, channel bandwidth, channel capacity, data rate, baud rate, Nyquist theorem, Signal to Noise Ratio, Shannon theorem, Information entropy, Noise Figure.	[08]
II	Data Transmission Techniques Analog Transmission: ASK,FSK,BPSK, QPSK,QAM Digital Transmission: PCM,PAM, Delta modulation	[08]
III	Data Communication Study of multiplexing: FDM, WDM, TDM, Introduction to multiple access: FDMA, TDMA, CDMA, Spread Spectrum techniques: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS)	[14]
IV	Network Models Comparison of computer network models: OSI model, TCP/IP model and IEEE reference model Physical Layer: Transmission Media - Twisted pair, Coaxial and Fiber optic cable Data Link Layer: Media Access Control (MAC), Hamming code, CRC	[06]
Reference Books	1. Communication Electronics Principles and Applications – Louis E. Frenzel, Tata McGraw Hill Education Private Limited, 3 rd Edition.2001, 20th reprint 2013. 2. Data Communications and Networking – Behrouz A Forouzan, Tata McGraw Hill Education Private Limited, Fourth Edition, Special Indian	

	Edition 2006, 17 th reprint 2010 3. Wireless Communication and Networks – William Stallings, Pearson Education, Second Edition 2004.
E-Resources	4. http://elcomhu.com/Electrical/electronic%20communication/Principles%20of%20Electronic%20Communication%20System%204th%20Edition%20by%20Louis%20Frenzel.pdf 5. http://crsgphathnikund.ac.in/wp-content/uploads/2018/09/Data-Communications-and-Networking-By-Behrouz-A.Forouzan.pdf 6. https://memberfiles.freewebs.com/00/88/103568800/documents/Data.And.Computer.Communications.8e.WilliamStallings.pdf

S.Y. B.Sc.(Electronics) Semester III

Subject: Practical Paper -1 (ELC2303): Paper title: Electronics Practical III

[Credits-2]

Course Outcomes

At the end of this course, students will be able to

- CO1** Acquire skills to write and execute assembly / C language programs.
- CO2** Apply knowledge for interfacing different Input / Output devices.
- CO3** Identify components and devices used in the circuit.
- CO4** Understand different modulator, multiplexer and multiple access circuits.

List of practicals (Compulsory 10 + 2 Activity)

Expt. No.	Title of experiment
1	Arithmetic, logical & code conversion problems using Assembly / C language programming
2	Interfacing Thumbwheel & Seven segment display using Assembly / C language programming
3	Traffic light control using Assembly / C language programming
4	Interfacing LCD using Assembly / C language programming
5	Waveform generation using DAC Interface using Assembly / C language programming
6	Event counters using Opto-coupler with seven segment display / LCD
7	Speed and direction Control of stepper motor using Assembly / C language programming
8	Pulse Code Modulation

9	Frequency Shift Keying
10	Time Division Multiplexing
11	Frequency Division Multiplexing
12	Amplitude Shift Keying
13	Code Division Multiple Access
14	Error detection and correction using Hamming code

S.Y. B.Sc.(Electronics) Semester IV**Subject: Electronics Paper -1 (ELC2401), Paper title: Single Board Computer****[Credits-2]****Course Outcomes**

At the end of this course, students will be able to

CO1 Acquire knowledge of Single board computer system.**CO2** Understand the Architecture of Raspberry Pi.**CO3** Develop skills of interfacing.**CO4** Learn Python programming language.

Unit	Details	Lectures
I	Introduction to Single board computer Basics of Single board computer, Introduction to ARM Cortex Processor, Raspberry Pi Series and Model, Comparison of various models of Raspberry Pi, Detailed specifications of Raspberry Pi 3B+:CPU, Storage devices, GPIO, Ethernet, Wi-Fi, Bluetooth, Power supply, Ports: USB, Display, Camera etc.	[08]
II	Architecture of Raspberry Pi-3B+ Block diagram of Raspberry Pi-3B+, Functions of each block, features of Broadcom processor, Pin Description, CPU Architecture: Pipeline stages, Cache Organization, Concept of branch Prediction & Folding, GPU Overview	[10]
III	Programming of Raspberry Pi using Python Benefits of Operating system, different types of OS, Overview of Raspberian OS, OS Installation, Configuration of Raspberry Pi, Installation of libraries, Basic Python Programming (Script programming), Functions: I/O function (GPIO, Digital), Time functions (Delays), Library functions Basic Arithmetic Programs	[08]
IV	Interfacing & Python Programming Basic :LED and Switch, LCD, Relay and Buzzer Advanced: Internal : Bluetooth, Wi-Fi, Ethernet, I ² C, SPI External: Camera interfacing, Serial Communication, GSM, Ultrasonic Sensor, PIR, Finger Print reader.	[10]
Reference Books	1. Raspberry Pi Cookbook: Software & Hardware problems and Solutions By Simon Monk, O'Reilly Media, 3 rd Edition 2019. 2. Python Crash Course: A Hands-On, Project-Based Introduction to Programming Raspberry Pi Robotic Projects - Third Edition– by Eric	

	<p>Matthes ,Third Edition 2015</p> <p>3. Machine Learning For Absolute Beginner By Oliver Theobald , 1st edition 2017</p> <p>4. Raspberry Pi User Guide By Eben Upton, GreathHalfacree, 3rd Edition 2014.</p> <p>5. Learn Raspberry Pi programming with Python By Wolfram Donat 1st Edition 2014.</p>
E-Resources	<p>http://mensshed-llandudno.co.uk/wp-content/uploads/Learn%20Raspberry%20Pi%20Programming%20with%20Python.pdf</p>

S.Y. B.Sc.(Electronics) Semester IV

Subject: Electronics Paper -2 (ELC2402), Paper title: Wireless Communication

[Credits-2]

Course Outcomes

At the end of this course, students will be able to

- CO1** Acquire the knowledge of mobile and wireless network systems.
- CO2** Understand concept of GSM and GPRS .
- CO3** Understand the working of wireless local area network, Bluetooth.
- CO4** Understand the basics of IoT.

Unit	Details	Lectures
I	<p>Introduction to wireless communication: Mobile Communication</p> <p>Need of wireless communication systems, Wired versus wireless communication,</p> <p>Antenna: Introduction, Need, working Principle, Parameters of antenna: Gain, directivity, Radiation pattern, Beam width, Bandwidth, Front to Back Ratio (FBR), Fundamentals of cellular system: Cell structure (Hexagonal cell geometry), Cluster, Co-channel interference, Frequency reuse concept.</p> <p>Cellular systems from 1G to 5G, LTE, IEEE wireless protocol 802.11</p> <p>GSM: Architecture, Call routing, Mobility management, IS 95: Architecture, Channel structure, Calls processing, Hand off, CDMA versus GSM</p>	[12]
II	<p>Wireless Technologies</p> <p>Bluetooth: Bluetooth architecture, Bluetooth protocol stack, Bluetooth frame structure</p> <p>Zigbee: Architecture, devices, topologies, applications</p> <p>Z wave: Protocol architecture</p> <p>RFID: Components, types, applications, advantages & disadvantages, GPRS.</p> <p>LoRa: Features and applications</p>	[08]
III	<p>GPS system</p> <p>Introduction, Components of GPS system (space segment, control</p>	[04]

	segment, user segment), GPS receiver, Applications.	
IV	<p>IoT Architecture & Applications / Case studies</p> <p>Introduction of IoT, General architecture (SOA based and API oriented architecture), IoT characteristics and need of Scalability, reliability, Interoperability of devices, Concept of QoS, Resource Reservation and scheduling, performance measurement, AI in IoT Overview of IoT in Indoor and Outdoor Environment -</p> <p>Indoor issues: Sensor to Gateway communication-hardware and software, low power local area networking (LPLAN), technologies focusing on home automation.</p> <p>Outdoor issues: Long range, low power wide area networking (LPWAN) technologies, LoRa and sigfox in unlicensed bands, and NB-IoT, LTE, Cat –M.</p> <p>Case Studies: 1. Smart Irrigation system for Agricultural field. Case Studies: 2 Smart Homes in Smart Cities.</p>	[12]
Reference Books	<ol style="list-style-type: none"> 1. Wireless Communications and Networks, William Stallings, Pearson Education Inc. 2nd Edition 2014. 2. Mobile Computing, Asoke K Talukder, Roopa R Yavagal, TMH, 1st edition 2007 3. Mobile Communications, Jochen Schiller, Pearson Education, 2nd Edition 2009 4. Wireless Communications and Networks, 3G and beyond, ITI SahaMisra, TMH. 2nd Edition 2017. 5. Principle of wireless Networks by Kaveh Pahlavan and Prashant Krishnamurthy, Pearson Education, 1st Edition 2002. 	
E-Resources	https://vulms.vu.edu.pk/Courses/CS431/Downloads/Wireless_Communications_&_Networking_Stallings_2nd.pdf	

S.Y. B.Sc.(Electronics) Semester IV**Subject: Practical Paper -2 (ELC2403), Paper title: Electronics Practical IV****[Credits-2]****Course Outcomes**

At the end of this course, students will be able to

- CO1** Understand architecture of Raspberry Pi3 B+.
- CO2** Apply knowledge to interface different Input / Output devices to Raspberry Pi.
- CO3** Acquire skills to write and execute Python programs for interfacing I/O devices.
- CO4** Understand different wireless communication systems.

List of practicals (Compulsory 10 + 2 Activity)

Expt. No.	Title of experiment
1	Interfacing light emitting diodes (LEDs) with Raspberry Pi
2	Interfacing Switch with Raspberry Pi to read its ON OFF status
3	Interfacing Temperature sensor with Raspberry Pi
4	Interfacing Photocell with Raspberry Pi
5	Programming Raspberry Pi for Motion detection
6	Interfacing camera with Raspberry Pi to capture the image
7	SIM card detection and Message transmission / reception using GSM / GPRS system
8	Study of GPS system
9	Study of Zig-bee for one application
10	Study of RFID system
11	Hands on Python programming.
12	LED switching using mobile.
13	LoRa Interfacing.