

**MANNAR THIRUMALAI NAICKER COLLEGE**  
**PASUMALAI, MADURAI- 625 004**

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

(Re-accredited with 'A' Grade by NAAC)



**B.Sc., Electronics and Communication**  
**SYLLABUS AND REGULATIONS**

UNDER  
CHOICE BASED CREDIT SYSTEM (CBCS)  
**(For those who joined during 2018-2019 and after)**

### Eligibility for Admission

Candidates seeking admission to the B.Sc (E&C) Degree course must have the Higher Secondary Education, (should have studied Physics or Mathematics in HSC) of the Government of Tamil Nadu or any other state or its equivalent qualification.

### Duration of the course

The duration of the course shall be three academic years comprising six semesters with two semesters in each academic year.

### Subject of Study

Part I: Tamil

Part II: English

Part III:

1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :

1. Non Major Electives
2. Skill Based Subjects
3. Environmental Studies
4. Value Education

Part V :

Extension activities

### The scheme of Examination

The components for continuous internal assessment are:

Two tests and their average	--15 marks
Seminar /Group discussion	--5 marks
Assignment	--5 marks
Total	--25 marks

**Pattern of the questions paper for the continuous Internal Assessment**

**(For Part I, Part II, Part III , NME & Skilled Paper in Part IV )**

The components for continuous internal assessment are:

**Part –A**

Six multiple choice questions (answer all) 6 x 01= 06 Marks

**Part –B**

Two questions (‘either .... or ‘type) 2 x 07=14 Marks

**Part –C**

One question out of two 1 x 10 =10 Marks

Total -----  
30 Marks  
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**Pattern of the question paper for the Summative Examinations:**

**Note: Duration- 3 hours**

**Part –A**

Ten multiple choice questions 10 x 01 = 10 Marks

(No Unit shall be omitted; not more than two questions from each unit.)

**Part –B**

Five Paragraph questions (‘either .... or ‘type) 5 x 07 = 35 Marks

(One question from each Unit)

**Part –C**

Three Essay questions out of five 3 x 10 =30 Marks

(One question from each Unit)

Total -----  
75 Marks  
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**The Scheme of Examination (Environmental Studies and Value Education)**

Two tests and their average	--15 marks
Project Report	<u>--10 marks*</u>
Total	<u>--25 marks</u>

\*\* The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

**Question Paper Pattern**

**Pattern of the Question Paper for Environmental Studies & Value Education only) (Internal)**

**Part –A**

(Answer is not less than 150 words)

Four questions (‘either .... or ‘type) 4 x 05=20 Marks

**Part –B**

(Answer is not less than 400 words)

One question (‘either .... or ‘type) 1 x 10=10 Marks

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Total	30 Marks
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**Pattern of the Question Paper for Environmental Studies & Value Education only) (External)**

**Part –A**

(Answer is not less than 150 words)

Five questions (either or type) 5 x 06 =30 Marks

(One question from each Unit)

**Part –B**

(Answer is not less than 400 words)

Three questions out of Five 3 x 15 = 45 Marks  
each unit (One question from each Unit)

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<b>Total</b>	75 Marks
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**Minimum Marks for a Pass**

40% of the aggregate (Internal +Summative Examinations).

No separate pass minimum for the Internal Examinations.

27 marks out of 75 is the pass minimum for the Summative Examinations.

### PROGRAMME SPECIFIC OUTCOMES

**PSO1:** To improve hardware and software skills in embedded system and Industrial Automation.

**PSO2:** To train the students to design and troubleshoot electrical equipments.

**PSO3:** To enrich the knowledge of students through technical communication which is used widely today.

**PSO4:** To enrich the knowledge of Bio-Medical instrumentation enables the student to fetch job in Bio-Medical field.

**COURSE PATTERN**

Study component	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total hours	Total credit	No. of course	Total marks
Part I Tamil	6(3)	6(3)	6(3)	6(3)			24	12	04	400
Part II English	6(3)	6(3)	6(3)	6(3)			24	12	04	400
Part III										
Core subjects	4(4)	4(4)	4(4) 4(4)	6(6)	4(4) 5(4)	5(5) 5(5)	41	40	9	900
Elective subjects	2(2)	2(2)			5(4)	4(4)	13	12	04	400
Core subjects(P)	2(0)	2(4)	2(0)	2(3) 2(3)	3(0) 3(0) 2(0)	3(4) 3(3) 2(4)	26	21	06	600
Allied subjects	4(4)	4(4)	4(4)	6(4)			18	16	04	400
Allied subjects(P)	2(0)	2(3)	2(0)		4(0)	4(3)	14	6	02	200
Part IV Skilled based subject	2(2)	2(2)			2(2) 2(2)	2(2) 2(2)	12	12	06	600
Non Major Elective			2(2)	2(2)			4	4	02	200
EVs/VE	2(2)	2(2)					4	4	02	200
Part V										
Extension activities				0(1)			0	01	01	100
<b>Total</b>	<b>30 (20)</b>	<b>30 (27)</b>	<b>30 (20)</b>	<b>30 (25)</b>	<b>30 (16)</b>	<b>30 (32)</b>	<b>180</b>	<b>140</b>	<b>44</b>	<b>4400</b>

**Volume II – Science Syllabus / 2018 - 2019**

<b>SEMESTER-I</b>							
Subject code	Title of the Paper	No. of Courses	Hours / week	credits	Maximum marks		
					Int	Ext	total
18UTAG11	<b>பகுதி-I: தமிழ் தற்கால கவிதையும் உரைநடையும்</b>	1	6	3	25	75	100
18UENG11	English-I: Exploring Language Through Literature-1	1	6	3	25	75	100
18UELC11	<b>Part-III Core Subject</b> Electronic Devices	1	4	4	25	75	100
18UELA11	<b>Part-III Allied Subject</b> Basic electricity and circuits	1	4	4	25	75	100
18UELE11	<b>Part-III Elective Subject</b> Electronic Instrumentation	1	2	2	25	75	100
18UELS11	<b>Part-IV Skilled Subject</b> Introduction to Computer Application	1	2	2	25	75	100
18UEVG11	<b>Part-IV Mandatory Subject</b> Environmental Studies	1	2	2	25	75	100
18UELCP1	<b>Part-III Core Subject (P)</b> Electronic Devices and Circuits – Lab	-	2	-	-	-	-
18UELAP1	<b>Part-III Allied Subject (P)</b> <b>Basic Electricity and circuits Lab</b>	-	2	-	-	-	-
	<b>Total</b>	<b>7</b>	<b>30</b>	<b>20</b>	<b>175</b>	<b>525</b>	<b>700</b>

<b>SEMSTER-II</b>							
18UTAG21	பகுதி-I தமிழ் பக்தி இலக்கியமும் நாடகமும்	1	6	3	25	75	100
18UENG21	English-II: Exploring Language Through Literature-II	1	6	3	25	75	100
18UELC21	<b>Part-III Core Subject</b> Electronic Circuits	1	4	4	25	75	100
18UELE21	<b>Part-III Elective Subject</b> Electronic Communication Systems	1	2	2	25	75	100
18UELA21	<b>Part-III Allied Subject</b> Allied Mathematics	1	4	4	25	75	100
18UELS21	<b>Part-IV Skilled Subject</b> Opto Electronics	1	2	2	25	75	100
18UVLG21	<b>Part-IV Mandatory Subject</b> Value Education	1	2	2	25	75	100
18UELCP1	<b>Part-III Core Subject (P)</b> Electronic Devices and Circuits - Lab	1	2	4	40	60	100
18UELAP1	<b>Part-III Allied Subject (P)</b> Basic Electricity and circuits Lab	1	2	3	40	60	100
	<b>Total</b>	<b>9</b>	<b>30</b>	<b>27</b>	<b>255</b>	<b>645</b>	<b>900</b>



**SEMSTER-III**

Subject code	Title of the Paper	No. of Courses	Hours / week	Credits	Maximum Marks		
					Int	Ext	Total
18UTAG31	<b>Part-I Tamil Subject</b> காப்பிய இலக்கியமும் சிறுகதையும்	1	6	3	25	75	100
18UENG31	<b>Part-II English Subject</b> Exploring Language Through Literature-III	1	6	3	25	75	100
18UELC31	<b>Part-III Core Subject</b> Digital Electronics	1	4	4	25	75	100
18UELC32	<b>Part-III Core Subject</b> Linear Integrated Circuits	1	4	4	25	75	100
18UELA31	<b>Part-III Allied Subject</b> Programming in C	1	4	4	25	75	100
18UELCP2	<b>Part-III Core Subject (P)</b> Digital Electronics - Lab	-	2	0	-	-	-
18UELAP2	<b>Part-III Core Subject (P)</b> Linear Integrated Circuits – Lab	-	2	0	-	-	-
18UELN31	<b>PART-IV NME</b> Microprocessor - 8085	1	2	2	25	75	100
	<b>Total</b>	<b>6</b>	<b>30</b>	<b>20</b>	<b>150</b>	<b>450</b>	<b>600</b>

**SEMESTER-IV**

Subject code	Title of the Paper	No. of Courses	Hours / week	Credits	Maximum Marks		
					Int	Ext	Total
18UTAG41	<b>Part-I Tamil Subject</b> பழந்தமிழ் இலக்கியமும் புதினமும்	1	6	3	25	75	100
18UENG41	<b>Part-II English Subject</b> Exploring Language Through Literature-IV	1	6	3	25	75	100
18UELC41	<b>Part-III Core Subject</b> Analog and Digital Communication Systems	1	6	6	25	75	100
18UELA41	<b>Part-III Allied Subject</b> Numerical Methods	1	6	4	25	75	100
18UELCP2	<b>Part-III Core Subject(P)</b> Digital Electronics - Lab	1	2	3	40	60	100
18UELAP2	<b>Part-III Core Subject (P)</b> Linear Integrated Circuits – Lab	1	2	3	40	60	100
18UELN41	<b>PART-IV NME</b> Mobile Communication	1	2	2	25	75	100
18UEAG40 - 18UEAG49	<b>Part-V</b> Extension activities	1	-	1	100	-	100
	<b>Total</b>	<b>8</b>	<b>30</b>	<b>25</b>	<b>305</b>	<b>495</b>	<b>800</b>

**SEMSTER-V**

Subject code	Title of the Paper	No. of Courses	Hours / week	Credits	Maximum Marks		
					Int	Ext	Total
18UELC51	<b>Part-III Core Subject</b> Microprocessors and Interfacing	1	4	4	25	75	100
18UELC52	<b>Part-III Core Subject</b> Sensors and Transducers	1	5	4	25	75	100
	<b>Part-III Elective Subject</b>						
18UELE51	<b>Internet of Things</b>	1	5	4	25	75	100
18UELE52	Industrial and Power Electronics						
18UELE53	Mobile Communication						
18UELS51	<b>Part-IV Skilled Subject</b> Fiber Optic Communication	1	2	2	25	75	100
18UELS52	<b>Part-IV Skilled Subject</b> Bio-Medical Instrumentation	1	2	2	25	75	100
18UELCP3	<b>Part-III Core Subject(P)</b> Communication - Lab	-	3	0	-	-	-
18UELAP3	<b>Part-III Allied Subject(P)</b> Sensors and Transducers - Lab	-	4	0	-	-	-
18UELCP4	<b>Part-III Core Subject(P)</b> Microprocessors and Microcontroller - Lab	-	3	0	-	-	-
18UELPR1	<b>Part-III Project</b> Project	-	2	0	-	-	-
	<b>Total</b>	<b>5</b>	<b>30</b>	<b>16</b>	<b>125</b>	<b>375</b>	<b>500</b>

**SEMESTER-VI**

Subject code	Title of the Paper	No. of Courses	Hours / week	Credits	Maximum Marks		
					Int	Ext	Total
18UELC61	<b>Part-III Core Subject</b> Microcontroller 8051 and Embedded Systems	1	5	5	25	75	100
18UELC62	<b>Part-III Core Subject</b> Digital Signal Processing	1	5	5	25	75	100
	<b>Part-III Elective Subject</b>						
<b>18UELE61</b>	<b>Industrial Automation</b>	<b>1</b>	<b>4</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
18UELE62	Antenna and Wave Propagation						
18UELE63	Microwave and Radar Systems						
18UELS61	<b>Part-IV Skilled Subject</b> Computer Networks	1	2	2	25	75	100
18UELS62	<b>Part-IV Skilled Subject</b> Television Systems	1	2	2	25	75	100
18UELCP3	<b>Part-III Core Subject(P)</b> Communication - Lab	1	3	4	40	60	100
18UELAP3	<b>Part-III Allied Subject(P)</b> Sensors and Transducers-Lab	1	4	3	40	60	100
18UELCP4	<b>Part-III Core Subject(P)</b> Microprocessors and Microcontroller - Lab	1	3	3	40	60	100
18UELPR1	<b>Part-III Project</b> Project	1	2	4	40	60	100
	<b>Total</b>	<b>9</b>	<b>30</b>	<b>32</b>	<b>285</b>	<b>615</b>	<b>900</b>



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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION**  
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<b>Programme</b>	<b>:B.Sc (E&amp;C)</b>	<b>Part III</b>	<b>: Core</b>
<b>Semester Code</b>	<b>: I</b>	<b>Hours</b>	<b>: 04</b>
<b>Subject Code</b>	<b>: 18UELC11</b>	<b>Credit</b>	<b>: 04</b>

**ELECTRONIC DEVICES**

**Course Outcomes:**

**CO1:** To learn the principles of working of the semiconductor devices

**CO2:** To study the operation of Electronic Devices.

**CO3:** To gain the knowledge of characteristics and uses of electronic devices

**CO4:** To understand the application of electronic devices in circuit design and troubleshooting (customer service)

**Unit 1: PN JUNCTION DIODES**

Introduction to PN junction diode – Construction – Working of the diode –VI characteristics – Diode resistance – Transition capacitance – Diffusion Capacitance – temperature effect.

**Unit 2: SPECIAL DIODES& CHARACTERISTICS**

Zener Diode, Varactor Diode, Tunnel Diode, Schottky Diode, PIN Diode –Construction –VI Characteristics – Applications

**Unit 3: TRANSISTOR**

Construction - types of transistors - configurations – characteristics – alpha, beta relations – Transistor as amplifier – transistor as a switch.

**Unit 4: FET and MOSFET**

Introduction – construction – working – n channel – p channel FET – Difference between Transistor and FET.

MOSFET –Construction – Enhancement type – Depletion type – Difference between FET and MOSFET

**Unit 5: THYRISTOR & INTRODUCTION TO IC'S**

Introduction -Construction and working of SCR, DIAC, TRIAC, IGBT-Introduction to fabrication of IC.

**Text books:**

1. R.S.Sedha, **Applied Electronics**, S.Chand& Company Ltd, New Delhi, first Edition, 1990
2. S.Salivahanan, N. Sureskumar and A. Vallavaraj, **Electronic Devices and Circuits**, Tata McGraw-Hill Publishing Company Ltd, New Delhi, Second Edition, 2011.
3. Principles of Electronics – V. K. Mehta – S.Chand publications.
4. Power Electronics –Dr.J.S.Chitode –Technical publications.

**UNIT I : Text Book 2 Chapter** (4.11,4.15,4.16,4.17,4.18)

**UNIT II : Text Book 1 Chapter** (13.01 to 13.20)

**UNIT III : Text Book 2 Chapter** (6.1 to 6.7)

**UNIT IV : Text Book 2 Chapter** (7.1 to 7.12 )

**UNIT V : Text Book 1 &4 Chapter** (17.1 to 17.29) ,1.14

**Reference books**

1. SantiramKal, **Basic Electronics: Devices, Circuits and Its Fundamentals**, PHI Learning Pvt. Ltd, New Delhi, First Edition, 2002.
2. A.P.Godse, U.A.Bakshi, **Electronic Devices**, Technical Publication, Pune, First Edition, 2009.



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<b>Programme</b> : B.Sc (E&C)	<b>Part III</b>	<b>: Allied</b>
<b>Semester</b> : I	<b>Credit</b>	<b>: 04</b>
<b>Subject Code</b> : 18UELA11	<b>Hours</b>	<b>: 04</b>

**BASIC ELECTRICITY AND CIRCUITS**

**Course Outcomes:**

- CO1:** To understand the basics of electricity, a.c.circuit analysis & network theorems, actuators.
- CO2:** Basic analysis of ac and dc signals is understood with the help of Circuit theorems.
- CO3:** Analysis of a.c. circuits is studied.
- CO4:** To gain knowledge on basic circuit theorems and electricity.

**Unit-I**

**Introduction to Electricity:**

Voltage – Current – Power and Energy – The circuit – Resistance Parameter – Capacitance Parameter – Inductance parameter – Energy sources – Polyphase system – Advantages of a Three-Phase system – Generation of Three-Phase voltages – Phase Sequence.

**Unit-II**

**Basics of Circuit analysis:**

Series and Parallel circuits-Resistances in series-Resistances in parallel-Current division rule-Voltage division rule-Mesh Current method –Node Voltage method (ac &dc excitation)-Cramer’s rule-Matrix method of analysis.

**Unit-III**

**Network Theorems:**

Ohm’s law-Kirchhoff’s law- -Star delta transformation- Superposition Theorem-Thevenin’s and Norton’s Theorem- Maximum power transfer theorem –Millman’s theorem.

**Unit-IV**

**Resonance and coupled circuits:**

Series and parallel resonance- Conductively coupled coils – single Tuned circuits - Double Tuned coupled circuits.

**Unit-V**

**Actuators:**

Introduction-DC Motor- Types of dc motor - Drives for dc motors – AC motor-Types of AC Motor--Synchronous Motor-Stepper motor- Servo motor.

**Text book:**

1. Electric Circuit Theory, S. Badrinarayanan, A. Usha Nandini
2. A. Sudhakar and Shyam Mohan, **Circuits and Networks Analysis and synthesis**, Tata MC Graw-Hill Publishing company LTD, New Delhi, Third edition-2007
3. N. Mathivanan, **PC Based Instrumentation**, PHI Learning Private Ltd, New Delhi, First Edition, 2007.

**UNIT I Text Book 2 Chapter 1 (1.1 – 1.8), Chapter 9 (9.1 – 9.4)**

**UNIT -II Text Book 1 Chapter 1 (1.0 – 1.14)**

**UNIT –III Text Book 1 Chapter 2 (2.0–2.5)**

**UNIT – IV Text Book 1 Chapter 3 (3.0 – 3.22)**

**UNIT – V Text Book 3 Chapter 3 (3.5.1 – 3.5.4)**

**Reference books**

1. A.K. Sawhney, Electrical and Electronic Measurements and Instrumentation, The Dhanpat Rai & Co (P) Ltd, New Delhi, Seventeenth Edition, 2000.
2. Chitra Shadrach and Sivakumar Vadivelu, Engineering Physics, Dorling Kindersley (India) Pvt. Ltd, License of Pearson Education, South Asia, Second Edition, 2010.





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**Programme : B.Sc (E&C)**  
**Semester : I**  
**Sub code : 18UELE11**

**Part III : Elective**  
**Hours : 02**  
**Credits : 02**

**ELECTRONIC INSTRUMENTATION**

**Course Outcomes:**

- CO1**To understand the working of electronic instruments.
- CO2:** To understand the concepts of basic analog and digital meters
- CO3:** To provide depth knowledge about the principle of oscilloscope
- CO4:** To gain the knowledge about the measuring instruments

**UNIT I**

**Indicating instruments:** Basic meter movement- PMMC – DC Ammeter- multirange Ammeter- Voltmeter -Multirange voltmeter- AC voltmeter using rectifiers-Ohm meter- Potentiometer- Multimeter- VTVM.

**UNIT II**

**Digital Instruments &Signal generators:** Digital multimeter - Digital frequency meter-digital measurement of time- digital tachometer-AF generator-oscillator- Function generator.

**UNIT III**

**Measurement of power:** Introduction- bolometer-bolometer method of power measurement- Calorimetric method-Watt meter-energy meter-Output Power meter - RF field Strength meter and Phase meter.

**UNIT IV**

**Wave Analyzers and Bridges:** Introduction - Basic wave Analyser – Super Heterodyne wave analyzer(Block diagram )

**Bridges:** DC resistance (Wheatstone Bridge) - AC Resistance (Wheatstone bridge) - Capacitance Schering bridge - Maxwell’s Bridge - Wiens Bridge (Resistance and Q of the Resonance Circuit)- Kelvin bridge.

## UNIT V

**Oscilloscope:** Basic principle - block diagram of oscilloscope –CRT-vertical and horizontal deflection system- Measurement of frequency by Lissajous method - Use of Lissajous figure for phase measurement.-Dual beam oscilloscope-Digital storage oscilloscope

### BOOKS FOR STUDY/REFERENCE

#### Text Book:

1. Electronic Instrumentation - H.S. Kalsi (2002), Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Electrical and Electronic Measurements and Instrumentation. A.K.Sahwney, (2006), Dhanpat Rai & Co.(P) Ltd., New Delhi.
3. Electronic Devices and Circuits - S.Salivahanan, N.Suresh kumar, A.Vallavaraj (1999), Tata McGraw-Hill Publishing Company Ltd, New Delhi..

**UNIT I : Text Book 1 Chapter** (2.2,3.1,3.2,4.3,4.4,4.13,4.14,4.21,4.25)

**Text Book 2 Chapter** (9.4, 20.3-20.32, 15.1)

**UNIT II : Text Book 1 Chapter** (6.2-6.4, 6.9,6.13)

**Text Book 2 Chapter** (8.3, 8.8)

**UNIT III : Text Book 1 Chapter** (20.1,20.3,20.4,20.10,10.2,10.3,10.4,10.5)

**UNIT IV : Text Book 1 Chapter** (9.1-9.6 ,11.1-11.2,11.13,11.17,11.14,10.7,11.3)

**UNIT V : Text Book 1 Chapter** (7.1,7.2,7.4,7.6,7.7,7.20,7.26,7.14,7.32)

#### Books for Reference:

1. Measurements and Instruments - Ramachandran, Priya Publishers, Trichy.
2. Electronics and Instrumentation - B.R.Gupta (2003), S.Chand & Company Ltd, New Delhi, Third Edition, 2008.
3. V.A.Bakshi, A.V.Bakshi, **Measurements and Instrumentation**, Technical Publications, Pune, First Edition, 2008.



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<b>Programme</b>	<b>: B.Sc (E&amp;C)</b>	<b>Part IV</b>	<b>: Skill</b>
<b>Semester</b>	<b>: I</b>	<b>Hours</b>	<b>: 02</b>
<b>Sub code</b>	<b>: 18UELS11</b>	<b>Credits</b>	<b>: 02</b>

**INTRODUCTION TO COMPUTER APPLICATION**

**Course Outcomes:**

**CO1:** To learn the concept of Internet and Internet of things.

**CO2:** To study the basics of Multimedia.

**CO3:** To understand Word, Excel and Power point.

**CO4:** To gain knowledge about Multimedia and Internet of things.

**CO5:** To gain the knowledge about OS.

**UNIT-I User Computer Interface & OS:**

Introduction –Hardware- Software –System Software –Application software –Introduction to OS-Types – Objectives - Functions –Examples.

**UNIT-II**

**MS-Word 2007:**

Introduction – Starting Word – Screen and its Components – The Office Button - The Ribbon – Examples-Introduction to Ms Excel-Basics of Spreadsheet-Ms Excel-Screen & its Components-Examples.

**UNIT-III**

**MS-PowerPoint 2007:** Introduction – Basics of PowerPoint – Start MS-PowerPoint – Screen and its components – Office Button – The Ribbon – Examples.

**UNIT-IV**

**Multimedia:**

Introduction – Definition – Characteristics of Multimedia system – Elements of Multimedia – Multimedia system – Multimedia Applications.

**UNIT-V**

**Internet and Internet of Things:** Introduction to Internet-Connecting to Internet -Internet Address-Internet Services- Internet of things and its applications.

**Text Book:**

1. Anita Goel, **Computer Fundamentals**, Pearson Education, New Delhi, 2010.

**UNIT I : Text Book 1 Chapter 6, 6.1, 6.2, 6.3, 6.4, 7.1,7.2,7.3,7.4 &7.11.**

**UNIT II : Text Book 1 Chapter 16 &17**

**UNIT III: Text Book 1 Chapter 18**

**UNIT IV: Text Book 1 Chapter 13**

**UNIT V:** lecture notes

**Reference Books:**

1. Vikas Gupta, **Comdex Computer Course Kit Windows 2007 with Office 2010**, Dream Tech Press, New Delhi, 2011.
2. Vikas Gupta, **Comdex Multimedia and Web Design Course Kit Windows 2007 with Office 2010**, Dream Tech Press, New Delhi, 2012.



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**Programme :B.Sc(E&C)**  
**Semester : I**  
**Sub code : 18UEVG11**

**Part IV : Mandatory**  
**Hours : 02**  
**Credits : 02**

**ENVIRONMENTAL STUDIES**

<b>COURSE OUTCOMES</b>	
<p><b>CO1:</b> To gain knowledge on the importance of environmental education and ecosystem.  <b>CO2:</b> To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution  <b>CO3:</b> To understand the various energy sources, exploitation and need of alternate energy resources. Disaster management To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence  <b>CO4:</b> To make the student to understand the various pollution problems control mechanisms.</p>	
UNIT I	<p><b>Environment and Earth:</b> Environment – Meaning – Definition - Components of Environment – Types of Environment. Interference of man with the Environment. Need for Environmental Education. Earth – Formation and Evolution of Earth – Structure of Earth and its components – Atmosphere, Lithosphere, Hydrosphere and Biosphere.  <b>Natural Resources:</b> Renewable Resources and Non-Renewable Resources. Natural Resources and Associated Problems. Use and Exploitation of Forest, Water, Mineral, Food, Land and Energy Resources.</p>
UNIT II	<p><b>Ecology and Ecosystems:</b> Ecology – Meaning - Definition – Scope – Objectives – Subdivisions of Ecology.  <b>Ecosystem</b> – Concept - Structure - Functions – Energy Flow – Food Chain and Food Web – Examples of Ecosystems (Forest, Grassland, Desert, Aquatic).</p>
UNIT III	<p><b>Biodiversity:</b> Definition – Biodiversity at Global, National and Local Level. Values of Biodiversity – Threats to Biodiversity – Conservation of Biodiversity.  <b>Biodiversity of India:</b> Biogeographical Distribution – Hotspots of Indian Biodiversity – National Biodiversity Conservation Board and Its functions. Endangered and Endemic Species of India</p>
UNIT IV	<p><b>Pollution Issues:</b> Definition – Causes – Effects and Control Measures of Air, Water, Soil, Marine, Noise, Thermal and Nuclear Pollutions.  <b>Global Issues:</b> Global Warming and Ozone Layer Depletion. Future plans of Global Environmental Protection Organisations.</p>
UNIT V	<p><b>Sustainable Development:</b> Key aspects of Sustainable Development – Strategies for Sustainable Development - Agriculture – Organic farming – Irrigation – Water Harvesting – Water Recycling – Cyber Waste and Management.  <b>Disaster Management:</b> Meaning – Types of Disasters - Flood and Drought – Earth quake and Tsunami – Landslides and Avalanches – Cyclones and Hurricanes – Preventions and Consequences. Management of Disasters -</p>

**Text Book:**

Study Material for **Environmental Studies**, Mannar Thirumalai Naicker College, Pasumalai, Madurai – 625 004.

**Reference Books:**

1. Study Material for **Environmental Studies**, Publications Division, Madurai Kamaraj University, Madurai – 625 021.
2. R.C. Sharma and Gurbir Sangha, **Environmental Studies**, Kalyani Publishers, 1, Mahalakshmi Street, T.Nagar, Chennai – 600 017.
3. Radha, **Environmental Studies for Undergraduate Courses of all Branches of Higher Education, (Based on UGC Syllabus)**, Prasanna Publishers & Distributors, Old No. 20, Krishnappa Street, (Near Santhosh Mahal), Chepak, Chennai – 600 005.
4. S.N.Tripathy and Sunakar Panda, **Fundamentals of Environmental Studies**, Vrinda Publications (P) Ltd. B-5, Ashish Complex, (opp. To Ahicon Public School), MayurVihar, Phase-1, Delhi– 110 091.
5. G.Rajah, **Environmental Studies for All UG Courses, (Based on UGC Syllabus)**, Margham Publications, 24, Rameswaram Road, T.Nagar, Chennai – 600 017.



**MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION**  
(For those who joined in 2018-2019 and after)

<b>Programme</b>	<b>: B.Sc (E&amp;C)</b>	<b>Part III</b>	<b>: Core(P)</b>
<b>Semester</b>	<b>: II</b>	<b>Hours</b>	<b>: 02</b>
<b>Sub code</b>	<b>: 18UELCP1</b>	<b>Credits</b>	<b>: -</b>

**ELECTRONIC DEVICES AND CIRCUITS - Lab**

**Course Outcomes:**

- CO1:** To study of electronic devices and circuits the Student will develop his servicing career of electronic systems.
- CO2:** To develop the skill in Rectifier Circuits.
- CO3:** To create awareness functions of oscillatory Circuits.
- CO4:** To develop practical skills in his own entrepreneurship.

**Lab Experiments: (Any 12)**

1. P-N junction diode characteristics.
2. Zener diode characteristics.
3. Half wave & Full wave Rectifier.
4. Bridge Rectifier.
5. Zener Regulated power supply.
6. IC Regulated power supply.
7. Transistor characteristics (common emitter).
8. Transistor Amplifier.
9. Emitter Follower.
10. Hartley Oscillator.
11. Colpitts Oscillator.
12. Phase Shift Oscillator.
13. Wiens Bridge Oscillator.
14. Clipping and clamping circuits.
15. Astable Multivibrator using Transistor.
16. Mono stable Multivibrator using Transistor.
17. FET characteristics.
18. FET Amplifier.
19. UJT characteristics.
20. Low Pass filter & High Pass filter using RC components.



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<b>Programme</b>	<b>: B.Sc (E&amp;C)</b>	<b>Part III</b>	<b>: Allied(P)</b>
<b>Semester</b>	<b>: II</b>	<b>Hours</b>	<b>: 02</b>
<b>Subject Code</b>	<b>: 18UELAP1</b>	<b>Credit</b>	<b>: -</b>

**BASIC ELECTRICITY AND CIRCUITS Lab**

**Course Outcomes:**

**CO1: To create skill in the Circuit analysis.**

**CO2: To understand and to develop knowledge on Calibration of electric circuits.**

**CO3: To enable the students to verify the various theorem with help of electric circuits.**

**CO4: To develop his practical skills in electricity.**

**LAB EXPERIMENTS (Any 12)**

1. Carry –foster bridge-(Resistance and specific resistivity).
2. Potentiometer-calibration of low range volt meter.
3. Potentiometer-calibration of high range volt meter.
4. Potentiometer-calibration of high range ammeter.
5. Conversion of galvanometer in to volt meter and ammeter.
6. Ballistic galvanometer -comparison of capacitance.
7. Solar cell.
8. LCR-series resonance.
10. Owens Bridge.
11. Verification of Ohm’S Law
12. Verification of KCL.
13. Verification of Thevenin’s Theorem
14. Verification of Nortons Theorem
15. Measurement of Unknown Resistance using Wheatstone Bridge.
16. Verification of KVL.
17. Verification of Superposition Theorem
18. Verification of Maximum Power Transfer theorem.





**MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION**  
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<b>Title of the Paper</b>	<b>: B.Sc (E&amp;C)</b>	<b>Part III</b>	<b>: Core</b>
<b>Semester</b>	<b>: II</b>	<b>Hours</b>	<b>: 04</b>
<b>Sub code</b>	<b>: 18UELC21</b>	<b>Credits</b>	<b>: 04</b>

**ELECTRONIC CIRCUITS**

**Course Outcomes:**

- CO1:** Students gain knowledge in analysis of Electronics circuits.
- CO2:** Students can analyze, design and implement circuits in applications.
- CO 3:** Students can design power supplies.
- CO 4:** Students can understand biasing.

**UNIT-I**

**Rectifier, Power supply and wave shaping circuits:**

Half wave rectifier- Full wave rectifier- Bridge rectifier- linear mode power supply- switch mode power supply- types of clipper and its operation- types of clamper and its operation- Applications.

**UNIT-II**

**Transistor biasing:**

Bias stability- Thermal runaway- stability factor - methods of transistor biasing: base resistor method- collector to base bias method- voltage divider bias method. FET biasing: self bias method –voltage divider bias method.

**UNIT-III**

**Amplifiers:**

Classification of amplifier- CE amplifier – RC coupled amplifier – transformer coupled amplifier – single tuned amplifier, stagger tuned amplifier- FET as an amplifier.

**UNIT-IV**

**Feedback and Power amplifiers:**

Concept of feedback – negative voltage feedback amplifier- negative current feedback amplifiers- class A, class B and class C power amplifiers-push pull amplifier- complementary symmetry amplifier.

**UNIT-V**

**Oscillators and multivibrators:**

Barkhausen criteria- Hartley oscillator-Colpitt's oscillator- Wien Bridge oscillator- crystal oscillator- UJT relaxation oscillator-Astable multivibrator-monostable multivibrator- Bistable multivibrator.

**Text books:**

1. S.Salivahanan, N. Sureskumar and A. Vallavaraj, **Electronic Devices and Circuits**, Tata McGraw-Hill Publishing Company Ltd, New Delhi, Second Edition, 2011
2. V.K Mehta, Rohit Mehta, **Principles of Electronics**, S.Chand & Company Ltd, New Delhi, First Edition, 1980.
3. R.S.Sedha, **Applied Electronics**, S.Chand & Company Ltd, New Delhi, First Edition, 1990.

**UNIT I : Text Book 1 Chapter**(15.1, 15.2.1, 15.2.2, 15.3, 4.22, 4.23 )

**UNIT II : Text Book 1 Chapter**( 6.9, 6.9.1, 6.9.2, 6.10.1, 6.10.2, 6.10.3, 7.16)

**UNIT III : Text Book 1 Chapter** (10.3.1, 10.7.4, 10.7.5, 10.8.1, 10.8.5, 10.5)

**UNIT IV : Text Book 1 Chapter** (12.1,12.2,12.3,12.4,10.6.1, 10.6.4,10.6.5,10.6.8)

**UNIT V : Text Book 1 Chapter** (13.3,13.5,13.6,13.10,13.11,14.3.1,14.3.2,14.3.3)

**Reference books:**

1. Santiram Kal, **Basic Electronics: Devices, Circuits and It Fundamentals**, PHI Learning Pvt. Ltd, New Delhi, First Edition, 2002.
2. A.P.Godse, U.A.Bakshi, **Electronics Circuits – I**, Technical Publication, Pune, 2009.
3. A.P.Godse., U.A.Bakshi, **Electronics Circuits – II**, Technical Publication, Pune, 2009.



**MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION**  
(For those who joined in 2018-2019 and after)

**Programme : B.Sc (E&C)**  
**Semester : II**  
**Sub code : 18UELE21**

**Part III : Elective**  
**Hours : 02**  
**Credits : 02**

**ELECTRONIC COMMUNICATION SYSTEMS**

**Course Outcomes:**

- CO1:** To study the concepts of communication systems
- CO2:** To gain the knowledge of Modulation techniques.
- CO3:** To study the concepts of satellite communication and Mobile communication systems.
- CO4:** To understand principles of electronic communications.

**UNIT I**

**Introduction:**

Communication process-source of information-communication networks-communication channel-modulation process-need for modulation- demodulation

**UNIT II**

**Analog communication:**

Introduction-Amplitude modulation-Angle modulation-Frequency modulation-Transmitter and receiver of AM and FM.

**UNIT III**

**Digital communication:**

Digital pulse modulation-PCM-Sampling-Quantizing-coding-delta modulation-wireless communication

#### UNIT IV

##### **Mobile Communication:**

Introduction: Cell Mobile Telephone system – Group of special mobile (GSM) – Multiple access techniques (TDMA, FDMA, CDMA)- Advanced systems –GPRS- Introduction to Mobile Communication Spectrum.

#### Unit V

##### **Satellite communication:**

Introduction – Active and passive satellite- structure of satellite communication-satellite orbits- Application-Attitude and orbit control system-TT&C-communication subsystems.

##### **Text books:**

1. Simon Haykin, Communications Systems, Wiley India, New Delhi, 4<sup>th</sup> Edition, Reprint. 2007.
2. K.S.Srinivasan, Principles of Communication System, Anuradha Publications, New Delhi, First Edition, Reprint 2007..
3. MonojitMitra, Satellite Communication, Prentice Hall of India, New Delhi, First Edition, 2005.

##### **Reference books:**

1. Simon Haykin, Analog and Digital Communications, Wiley India, New Delhi, 1<sup>st</sup> Edition, Reprint. 2003
2. B.P.Lathi, Communication Systems, Wiley Eastern University Edition, USA, First Edition Reprint 1994.
3. B.P.Lathi, Modern Digital and Analog Communication Systems, Prism Books Private Ltd, Newyork, Second Edition, 1993.

**UNIT I : Text Book 1 Chapter (1 -8)**

**UNIT II : Text Book 1 Chapter (2.1-2.2, 2.6, 2.7)**

**Text Book 2 Chapter (2.28, 2.46)**

**UNIT III : Text Book 1 First Edition Chapter (5.1-5.8)**

**UNIT IV : (Prepared by Department)**

**UNIT V : Text Book 1 Chapter (1.1,1.3,1.5,1.4,3.2,3.3)**



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<b>Programme</b>	<b>: B.Sc (E &amp; C)</b>	<b>Part III</b>	<b>: Allied</b>
<b>Semester</b>	<b>: II</b>	<b>Hours</b>	<b>:04</b>
<b>Code</b>	<b>: 18UELA21</b>	<b>Credits</b>	<b>:04</b>

**ALLIED MATHEMATICS**

**Course Outcomes:**

- CO1:** To Provide the students with calculation competency, concept understanding and mathematical literacy.
- CO2:** To use computational techniques and algebraic skills for the study of matrix algebra, eigenvalues and eigenvectors.
- CO3:** To make the students to evaluate definite and indefinite integrals and use them in applications.
- CO4:** This course enable the students to use the problem solving skills in a wide variety of situations.

- Unit – I** Matrix Algebra – Introduction – Operations – Inverse, Rank of matrix – Solution of Simultaneous linear equations – Eigen values & Eigen vectors.
- Unit - II** Theory of equation – An  $n^{\text{th}}$  degree equation has exactly  $n$  roots – Relation between the roots and the coefficients
- Unit - III** Finding the roots upto two decimals by Newton’s method and Horner’s Method
- Unit -IV** Radius of curvature, Center of curvature of plane curves.
- Unit - V** Integral calculus: Integration –Integration by Parts.

**Text Book:**

1. Dr. M.Venkatraman, Dr. N. Sridharan & N.Chandrasekaran, **Discrete Mathematics**, The National Publishing Company.
2. Dr. S.Arumugam, **Ancillary Mathematics Volume I**, New Gamma Publication, Palayamkottai, Reprint 2006.

Unit I-	Chapter:6.	Section: 6.1 to 6.5, 6.7
Unit II-	Chapter 1:	Page No: 1 to 26
Unit III-	Chapter 1:	Page No :40 to 48
Unit IV-	Chapter 3:	Page No: 65 to 90
Unit V-	Chapter 3	Page No: 91 to 113

**Reference Books:**

1. T.K .ManicavasagamPillai and S.Narayanan, **Algebra, Volume I and II**, S.ViswanthanPrinters and Publishers Pvt Ltd, Chennai, 2009 (Unit I to IV).
2. T.KManicavasagampillai and S.Narayanan, **Trigonometry Volume III and IV**, S.ViswanthanPrinters and Publishers Pvt Ltd, Chennai, 2009 (Unit V).



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**Programme : B.Sc(E&C)**  
**Semester : II**  
**Sub code : 18UELS21**

**Part IV : Skill**  
**Hours : 02**  
**Credits : 02**

**OPTOELECTRONICS**

**Course Outcomes:**

- CO1:** To understand the concepts of Optical process in Semiconductors.
- CO2:** To provide beneficial knowledge about the Optical source and detectors
- CO3:** To gain the knowledge about the LASER.
- CO4:** To gain the knowledge about Fiber Optic Communication as a Emerging trend.

**Unit –I**

**Energy bands & Band gap in Semiconductors:**

Formation of energy bands in semiconductors-energy band diagram-Direct band gap and Indirect band gap semiconductor-Density of states-Optical absorption.

**Unit –II**

**Optical Process & Detectors :**

Luminescence –Photo luminescence –Electroluminescence-Solar Cell  
LED-IR Emitter-Photodiode-PIN-APD- photo transistor –Photothyristor -SLD-Photothermistor

**Unit –III**

**LASER Principle & types:**

Population inversion-Laser principle-Types of laser sources-Ruby laser-He-Ne-laser-Carbon dioxide laser-Semiconductor laser-Surface emitting laser-Edge emitting laser.

**Unit-IV**

**Optoelectronic Devices**

Photoconductive sensors-Photo emissive Sensors-Photovoltaic sensors-LCD  
Opto coupler.

## Unit –V

### **Fiber optic Communication:**

Optical Fiber- Characteristics-Acceptance angle –Numerical aperture-Step index fiber –Graded index fiber-Attenuation in optical fiber-Applications.

### **Text Book:**

1. Asit Baran Maity, Optoelectronics and optical fiber sensors, PHI, edition, 2013.
2. S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, Electronic Devices and Circuits –, The Mc Graw-Hill Companies.
3. Dr.M.Arumugam, Optical Fiber Communication and sensors –.I edition, 2002
4. A.Ubald raj, Opto Electronics –G.Jose Robin, Indira Publications, edition, ,2002

**UNIT I : Text Book 1** Chapter3 (3.1-3.3& lecture notes)

**UNIT II : Text Book 1** Chapter 3 (3.4.1-3.4.3, 6.5.1- 6.5.3, 6.6.1 & lecture notes).

**UNIT III: Text Book 1** Chapter 5 (lecture notes,5.5.5, 5.6.1,5.6.4&5.6.5)

**UNIT IV: Text Book 2** Chapter 18 (18.3-18.5,18.7 &18.10)

**UNIT V: Text Book 2** Chapter 18 (18.11 &lecture notes)

### **Reference Books:**

1. Pallab Bhattacharya, Semiconductor optoelectronic Devices, Prentice India Pvt Ltd, Second Edition,2006.
2. Gerd Keiser, optical Fiber Communications, Tata Mc Graw Hill, Fourth Edition.
3. Subir Kumar Sarkar,Optical fibres and fibre optic communication Systems S.Chand&Co Pvt.Ltd,2000.





**MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION**  
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**Programme : B.Sc (E&C)**  
**Semester : II**  
**Sub code : 18UVLG21**

**Part IV : Mandatory**  
**Hours : 02**  
**Credits : 02**

**VALUE EDUCATION**

<b>COURSE OUTCOMES</b>	
<p><b>CO1:</b> Clarifying the meaning and concept of value - value education.  <b>CO2:</b> To inspire <b>students</b> to develop their personality and social <b>values</b> based on the principles of human <b>values</b>.  <b>CO3:</b> Developing sense of Love, Peace and Brotherhood at Local, national and international levels.  <b>CO4:</b> To enable the students to understand the social realities and to inculcate an essential value system towards building a health society</p>	
UNIT I	<p><b>Values and The Individual:</b> Values – Meaning – Definition – Importance – Classification of Values, Value Education – Meaning – Need for Value Education. Values and the Individual – Self-Discipline – Meaning – Tips to Improve Self-Discipline. Self-Confidence – Meaning - Tips to Improve Self-Confidence. Empathy – Meaning – Role of Empathy in motivating Values. Compassion – Role of Compassion in motivating Values. Forgiveness – Meaning - Role of Forgiveness in motivating Values. Honesty – Meaning – Role of Honesty in motivating Values. Courage – Meaning – Role of Courage in motivating Values.</p>
UNIT II	<p><b>Religions and Communal Harmony:</b> Religions – Meaning – Major Religions in India - Hinduism – Values in Hinduism. Christianity – Values in Christianity. Islam – Values in Islam. Buddhism – Values in Buddhism. Jainism – Values in Jainism. Sikhism – Values in Sikhism. Need for Religious Harmony in India. Caste System in India – Need for Communal Harmony in India. Social Justice – Meaning – Factors Responsible for Social Justice.</p>
UNIT III	<p><b>Society and Social Issues:</b> Society – Meaning – Values in Indian Society. Democracy – Meaning – Values in Indian Democracy. Secularism – Meaning – Values in Indian Secularism. Socialism – meaning – Values in Socialism. Social Issues – Alcoholism – Drugs – Poverty – Unemployment.</p>

UNIT IV	:	<b>Human Rights and Marginalised People:</b> Human Rights – Meaning – Problem of Violation of Human Rights in India – Authorities available under the Protection of Human Rights Act in India. Marginalised People like Women, Children, Dalits, Minorities, Physically Challenged – Concept – Rights – Challenges. Transgender – Meaning – Issues.
UNIT V	:	<b>Social Institutions in Value Formation:</b> Social Institutions – Meaning – Important Social Institutions. Family – Meaning – Role of Families in Value Formation. Role of Press & Mass Media in Value Formation – Role of Social Activists – Meaning Contribution to Society – Challenges.

**Text Book:**

Text Module for **Value Education**, Mannar Thirumalai Naicker College, Pasumalai, Madurai – 625 004

**Reference Books:**

1. Text Module for **Value Education**, Publications Division, Madurai Kamaraj University, Madurai – 625 021.
2. N.S.Raghunathan, **Value Education**, Margham Publications, 24, Rameswaram Road, T.Ngar, Chennai – 600 017.
3. Dr.P.Saravanan, and P.Andichamy, **Value Education**, Merit India Publications, (Educational Publishers), 5, Pudumandapam, Madurai-625001.



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<b>Semester</b>	<b>: II</b>	<b>Hours</b>	<b>: 02</b>
<b>Sub code</b>	<b>: 18UELCP1</b>	<b>Credits</b>	<b>: 04</b>

**ELECTRONIC DEVICES AND CIRCUITS - Lab**

**Course Outcomes:**

**CO1:** To study of electronic devices and circuits the Student will develop his servicing career of electronic systems.

**CO2:** To develop the skill in Rectifier Circuits.

**CO3:** To create awareness functions of oscillatory Circuits.

**CO4:** To develop practical skills in his own entrepreneurship.

**Lab Experiments: (Any 12)**

1. P-N junction diode characteristics.
2. Zener diode characteristics.
3. Half wave & Full wave Rectifier.
4. Bridge Rectifier.
5. Zener Regulated power supply.
6. IC Regulated power supply.
7. Transistor characteristics (common emitter).
8. Transistor Amplifier.
9. Emitter Follower.
10. Hartley Oscillator.
11. Colpitts Oscillator.
12. Phase Shift Oscillator.
13. Wiens Bridge Oscillator.
14. Clipping and clamping circuits.
15. Astable Multivibrator using Transistor.
16. Mono stable Multivibrator using Transistor.
17. FET characteristics.
18. FET Amplifier.
19. UJT characteristics.
20. Low Pass filter & High Pass filter using RC components.



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<b>Programme</b>	<b>: B.Sc (E&amp;C)</b>	<b>Part III</b>	<b>: Allied(P)</b>
<b>Semester</b>	<b>: II</b>	<b>Hours</b>	<b>: 02</b>
<b>Subject Code</b>	<b>: 18UELAP1</b>	<b>Credit</b>	<b>: 03</b>

**BASIC ELECTRICITY AND CIRCUITS Lab**

**Course Outcomes:**

**CO1: To create skill in the Circuit analysis.**

**CO2: To understand and to develop knowledge on Calibration of electric circuits.**

**CO3: To enable the students to verify the various theorem with help of electric circuits.**

**CO4: To develop his practical skills in electricity.**

**LAB EXPERIMENTS (Any 12)**

1. Carry –foster bridge-(Resistance and specific resistivity).
2. Potentiometer-calibration of low range volt meter.
3. Potentiometer-calibration of high range volt meter.
4. Potentiometer-calibration of high range ammeter.
5. Conversion of galvanometer in to volt meter and ammeter.
6. Ballistic galvanometer -comparison of capacitance.
7. Solar cell.
8. LCR-series resonance.
10. Owens Bridge.
11. Verification of Ohm’S Law
12. Verification of KCL.
13. Verification of Thevenin’s Theorem
14. Verification of Nortons Theorem
15. Measurement of Unknown Resistance using Wheatstone Bridge.
16. Verification of KVL.
17. Verification of Superposition Theorem
18. Verification of Maximum Power Transfer theorem.