

**HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)  
COIMBATORE – 641028.**

**B.Sc. ELECTRONICS AND COMMUNICATION SYSTEMS  
SCHEME OF EXAMINATIONS – CBCS PATTERN**

*(For the students admitted from the Academic year 2017 - 2018 and onwards)*

CODE No.	SUBJECT	LECTURE Hrs./ WEEK	EXAM. Dur. Hrs.	Max. Marks			Credit Points
				IE	EE	Total	
<b>First Semester</b>							
<b>Part - I</b>							
16LAT01/ 16LAH01/ 16LAF01/ 16LAM01	Tamil - I/Hindi - I/French - I/Malayalam - I	6	3	25	75	100	3
<b>Part - II</b>							
16ENG01	English - I	6	3	25	75	100	3
<b>Part - III</b>							
17ELU01	Principles of Electronics	6	3	25	75	100	5
17ELU02	Allied: Mathematics-I (MAT)	6	3	25	75	100	5
17ELU05	Practical I: Principles of Electronics Lab	3	-	-	-	-	-
17ELU06	Practical II: Semiconductor Devices Lab	3	-	-	-	-	-
<b>Second Semester</b>							
<b>Part - I</b>							
16LAT02/ 16LAH02/ 16LAF02/ 16LAM02	Tamil -II/Hindi -II/French -II /Malayalam -II	6	3	25	75	100	3
<b>Part - II</b>							
16ENG02	English - II	6	3	25	75	100	3
<b>Part - III</b>							
17ELU03	Semiconductor Devices	5	3	25	75	100	5
17ELU04	Allied: Mathematics-II (MAT)	5	3	25	75	100	5
17ELU05	Practical I: Principles of Electronics Lab	3	3	40	60	100	4
17ELU06	Practical II: Semiconductor Devices Lab	3	3	40	60	100	4
<b>Part - IV</b>							
16GSU01	Value Education - Human Rights	2	-	100	-	100	2
<b>Third Semester</b>							
<b>Part - III</b>							
17ELU07	Principles of Communication System	5	3	25	75	100	4
17ELU08	Digital Electronics and its Applications	5	3	25	75	100	4
17ELU09	Electronic Circuits	5	3	25	75	100	4
17ELU10	Programming in C	4	3	25	75	100	4
17ELU11	Practical III: C Programming Lab	3	3	40	60	100	2

17ELU15	Practical IV: Electronic Circuits Lab	3	-	-	-	-	-
17ELU16	Practical V : Analog and Digital IC Lab	3	-	-	-	-	-
<b>Part - IV</b>							
16GSU02	Environmental Studies	2	-	100	-	100	2
<b>Fourth Semester</b>							
<b>Part - III</b>							
17ELU12	Microwave and Fiber Optic Communication	5	3	25	75	100	4
17ELU13	Integrated Circuits and Instrumentation	5	3	25	75	100	4
17ELU14	PCB Design and Fabrication	5	3	25	75	100	4
17ELU15	Practical IV: Electronic Circuits Lab	4	3	40	60	100	4
17ELU16	Practical V: Analog and Digital IC Lab	4	3	40	60	100	4
17ELU17	Practical VI: Communication Systems Lab	5	3	40	60	100	4
<b>Part - IV</b>							
16GSU03	<b>Skill Based: Internet Security</b>	2	-	100	-	100	2
<b>Part - V</b>							
16GSU04	<b>Extension Activity</b>	-	-	100	-	100	2
<b>Fifth Semester</b>							
<b>Part - III</b>							
17ELU18	Cellular Communication System	5	3	25	75	100	4
17ELU19	VLSI Design Tools	5	3	25	75	100	4
17ELU20	8051 Microcontroller	5	3	25	75	100	4
17ELU21	Practical VII: Circuit Simulation Lab	5	3	40	60	100	2
17ELU26	Practical VIII: Industrial Electronics Lab	3	-	-	-	-	-
17ELU27	Practical IX: Embedded Systems Lab	3	-	-	-	-	-
17ELU22	<b>Elective - I</b> (a) Medical Electronics <b>OR</b> (b) Consumer Electronics	4	3	25	75	100	4
<b>Part - IV</b>							
16GSU05	<b>Non - Major Elective: General Awareness</b>	-	-	100	-	100	2
<b>Part - V</b>							
16GSU06	Law of Ethics	-	-	100	-	100	2
<b>Sixth Semester</b>							
<b>Part - III</b>							
17ELU23	Satellite and Network Communication	5	3	25	75	100	4
17ELU24	Industrial and Power Electronics	5	3	25	75	100	4
17ELU25	Embedded Systems	5	3	25	75	100	4
17ELU26	Practical VIII: Industrial Electronics Lab	3	3	40	60	100	4
17ELU27	Practical IX: Embedded Systems Lab	3	3	40	60	100	4
17ELU28	<b>Elective - II</b> (a) Robotics and Automation <b>OR</b> (b) Automotive Electronics	5	3	25	75	100	4
17ELU29	Project Work	4	-	40	60	100	4
							140

## REGULATIONS

### Components for Evaluation:

#### 1. Internal Examination Marks (For Part III theory papers)

Components	Marks
Test –I & II (Best of Two)	10
Model Exam	10
Assignment	5
<b>Total</b>	<b>25</b>

#### QUESTION PAPER PATTERN FOR I.E TEST I and II

(2 HOURS TEST)

**MAXIMUM: 50 Marks**

##### SECTION - A (20 Marks)

Answer **ALL** Questions

**ALL** Questions Carry **EQUAL** Marks

(10 x 2 = 20 marks)

Short answers 10

##### SECTION - B (10 Marks)

Answer **ALL** Questions

**ALL** Questions Carry **EQUAL** Marks

(2 x 5 = 10 marks)

Either or Type

##### SECTION - C (20 Marks)

Answer any **TWO** Questions out of **THREE** questions

**ALL** Questions Carry **EQUAL** Marks

(2 x 10 = 20 marks)

#### QUESTION PAPER PATTERN FOR IE Model Examination

(3 HOURS TEST)

**MAXIMUM: 75 Marks**

##### SECTION - A (20 Marks)

Answer **ALL** Questions

**ALL** Questions Carry **EQUAL** Marks

(10 x 2 = 20 marks)

**TWO** questions from each unit

##### SECTION - B (25 Marks)

Answer **ALL** Questions

**ALL** Questions Carry **EQUAL** Marks

(5 x 5 = 25 marks)

Either or Type.

ONE question from each unit with internal choice

**SECTION - C (30 Marks)**Answer any **THREE** Questions out of **FIVE** questions**ALL** Questions Carry **EQUAL** Marks

(3 x 10 = 30 marks)

ONE question from each unit

**2 a) Components for Practical I.E.**

Components	Marks
Test -I	20
Test - II	20
<b>Total</b>	----- <b>40</b> =====

**2 b) Components for Practical E.E.**

Components	Marks
Completion of Experiments	50
Record	5
Viva	5
<b>Total</b>	----- <b>60</b> =====

**3. Institutional/ Industrial Training, Mini Project and Major Project Work**

<u>Institutional /Industrial Training</u>		<u>Mini Project</u>	<u>Major Project Work</u>	
Components	Marks	Marks	Components	Marks
<b>I.E</b>			<b>I. E</b>	
Work Diary	25	-	a) Attendance 10 Marks	40
Report	50	50	b) Review /	
Viva -voce	25	50	Work Diary* <sup>1</sup> 30 Marks	
Examination				
<b>Total</b>	----- <b>100</b> =====	----- <b>100</b> =====	<b>E.E</b> * <sup>2</sup>	
			a) Final Report 40 Marks	60
			b) Viva-voce 20 Marks	
			<b>Total</b>	----- <b>100</b> =====

\*<sup>1</sup> Review is for Individual Project and Work Diary is for Group Projects (Group consisting of minimum 3 and maximum 5)

\*<sup>2</sup>Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

#### 4. Components for Value Education (Part IV):

S. No.	Components	Marks
a)	Attendance 96% and above - 30 marks 91% to 95% - 25 marks 86% to 90% - 20 marks 76% to 85% - 10 marks	30 marks
b)	Participation in group activity	30 marks
c)	Assignment (2 x 10)	20 marks
d)	Test (1 hr for 20 marks) 2 out of three questions, 10 marks each	20 marks
<b>Total</b>		<b>100 marks</b>

On completion of the above components students will be remarked as follows:

Range of marks	Equivalent remarks
80 and above	Exemplary
70 – 79	Very good
60 – 69	Good
50 – 59	Fair
40 – 49	Satisfactory
Below 39	Not Satisfactory = Not completed

- The passing minimum for this paper is 40%
- In case, the candidate fails to secure 40% passing minimum, he / she may have to reappear for the same in the subsequent semesters.

#### 5. Guidelines for Environmental Studies (Part IV)

- The paper Environmental Studies is to be treated as 100% IE course which is offered in III Semester for II year UG students.
- The classes will be handled for two hours per week till the end of the Semester. At least one field trip should be arranged.
- Total Marks for the subject = 100

Components	Marks
Two Tests (2 x 30)	60
Field visit and report (10 + 10)	20
Two assignments (2 x 10)	20
<b>Total</b>	----- <b>100</b> =====

The question paper pattern is as follows:

**Test I** – 2 hours [3 out of 5 essay type questions] 3 x 10 = 30 Marks

**Test II** – 2 hours [3 out of 5 essay type questions] 3 x 10 = 30 Marks

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**Total 60 Marks**  
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- The passing minimum for this paper is 40%
- In case, the candidate fails to secure 40% passing minimum, he / she may have to reappear for the same in the subsequent semesters.

**6. Guidelines for Skill based subject - Internet Security (Part IV)**

Components	Marks
Two Tests (2 x 40)	80
Two assignments (2 x 10)	20
<b>Total</b>	----- <b>100</b> =====

The question paper pattern is as follows:

a) Test I – 2 hours [4 out of 7 essay type questions] 4 x 10 = 40Marks

b) Test II – 2 hours [4 out of 7 essay type questions] 4 x 10 = 40 Marks

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**Total 80 Marks**  
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- The passing minimum for this paper is 40%
- In case, the candidate fails to secure 40% passing minimum, he / she may have to reappear for the same in the subsequent semesters

**7. Guidelines for General Awareness (Part IV)**

Components	Marks
Two Tests (2 x 50)	100

The question paper pattern is as follows:

Test I – 2 hours [50 multiple choice questions] 50 x 1 = 50Marks

Test II – 2 hours [50 multiple choice questions] 50 x 1 = 50 Marks

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**Total 100 Marks**  
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- The passing minimum for this paper is 40%
- In case, the candidate fails to secure 40% passing minimum, he / she may have to reappear for the same in the subsequent semesters

## 8. Guidelines for Law of Ethics (Part V)

Components	Marks
Two Tests (2 x 50)	100

The question paper pattern is as follows:

- c) Test I – 2 hours [5 out of 8 essay type questions] 5 x 10 = 50Marks  
d) Test II – 2 hours [5 out of 8 essay type questions] 5 x 10 = 50 Marks

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**Total 100 Marks**  
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- The passing minimum for this paper is 40%
- In case, the candidate fails to secure 40% passing minimum, he / she may have to reappear for the same in the subsequent semesters

## 9. Guidelines for Extension Activity (Part V)

- Atleast two activities should be conducted within this semester (IV) consisting of two days each.
- The activities may be Educating Rural Children, Unemployed Graduates, Self Help Group etc.

The marks may be awarded as follows

No of Activities	Marks
2 x 50 ( Each Activity for two days)	100

## 10. QUESTION PAPER PATTERN FOR EE (Part III Theory Papers)

**(3 HOURS TEST)**

**MAXIMUM: 75 Marks**

### SECTION - A (20 Marks)

Answer **ALL** Questions

**ALL** Questions Carry **EQUAL** Marks

(10 x 2 = 20 marks)

**TWO** questions from each unit

### SECTION - B (25 Marks)

Answer **ALL** Questions

**ALL** Questions Carry **EQUAL** Marks

(5 x 5 = 25 marks)

Either or Type.

**ONE** question from each unit with internal choice

### SECTION - C (30 Marks)

Answer any **THREE** Questions out of **FIVE** questions

**ALL** Questions Carry **EQUAL** Marks

(3 x 10 = 30 marks)

**ONE** question from each unit

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Code No	Subject	Semester No
17ELU01	PRINCIPLES OF ELECTRONICS	I
<b>Objective:</b>	To enable the students to learn, the passive components and their applications in Electronic Circuits.	
Unit No	Topics	Hours
Unit I	<b>Introduction to Electricity</b> Negative and positive polarities – Structure of atom – Electric Charge – Voltage – Current – Direct Current (DC) – Alternating Current (AC) – Frequency – Period – Wavelength – Phase angle – Sources of electricity.	15
Unit II	<b>Fundamentals of Electronic Components</b> Resistor: Ohms Law – Color coding – Types: Fixed and Variable – Rheostats and Potentiometers – Power rating – Resistors in serial and parallel. Capacitor: Principles of capacitance – Types: Electrolytic capacitors – Capacitor coding – Capacitor in series and parallel. Inductor: Principles of inductance – Types – Inductor in serial and parallel.	15
Unit III	<b>Basic Laws of Electronic Circuits</b> Power dissipation in resistance – Voltage and Current Dividers – Kirchoff's Voltage Law (KVL) – Kirchoff's Current Law (KCL) – Method of branch Currents – Node Voltage Analysis – Method of mesh currents – Concept of voltage source and current source – Voltage source in series and current source in parallel.	15
Unit IV	<b>Network Theorems</b> Superposition Theorem – Thevenin's Theorem – Thevenizing a circuit with two voltage source – Thevenizing a bridge circuit – Nortons theorem– Thevenin-Norton Conversion – Conversion of Voltage and Current Sources – Millman's Theorem – Maximum Power Transfer Theorem – T or Y and $\pi$ or $\Delta$ Connections.	15
Unit V	<b>AC Circuits</b> Alternating Current: Resistance circuit – Capacitance circuit ( $X_C$ ) – Inductance circuit ( $X_L$ ) – $X_L$ and $X_C$ in series and parallel – Analysis of resonance circuits – Series resonance – Parallel resonance. RC Filters: RC low pass filter – RC high pass filter – RC band pass filter – RC band stop filter.	15

**Text Book:**

1. Bernard Grob and Mitchel E Schultz "Basic Electronics", Tata McGraw Hill, 9<sup>th</sup> Edition, 2005.

**Reference Books:**

1. S.Salivahanan, N.Suresh Kumar & A.Vallavaraj, "Electronic Devices and Circuits", Tata McGraw-Hill, 1998.
2. B.V.Narayana Rao, "Principles of Electronics", Wiley Eastern Limited, 1992.
3. B.L.Theraja, "Basic Electronics-Solid State Devices", S.Chand, 2000.
4. Malvino, Albert Paul, "Electronic Principles", Tata McGraw – Hill, Sixth Edition, 2004.
5. V.K. Mehta, Rohit Mehta, "Principles of Electronics", S.Chand and Company Ltd., 2005.

  
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Code No.	Subject	Semester No.
17ELU03	SEMICONDUCTOR DEVICES	II
<b>Objective:</b>	To equip the students to learn the construction, working and characteristics of various semiconductor devices.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Atomic Structure and Semiconductor Physics</b> Bohr's atomic model – Energy levels – Energy bands – Energy bands in solids – Classification of solids and energy bands – Semiconductor – Bonds in semiconductors – Energy band description of semiconductors – Effect of temperature on semiconductor – Hole current – Intrinsic semiconductor – Extrinsic semiconductor – n-type and p-type semiconductor – Majority and minority carriers – PN junction – Forward and reverse biased PN junction.	12
<b>Unit II</b>	<b>Semiconductor Diodes</b> Zener diode – Zener diode as a voltage regulator – Tunneling effect and Tunnel diode – Varactor diode – PIN diode – Schottky Diode – Step recovery diode – Thermistor – Gunn diode – LED – Photo diode.	12
<b>Unit III</b>	<b>Transistors</b> Introduction – Transistor as an Amplifier – CB, CE and CC Configurations – Comparison of transistor configurations – Transistor load line analysis – Operating point – Cut off and saturation points – Power ratings – Transistor biasing and its types.	12
<b>Unit IV</b>	<b>Field Effect Transistors</b> Junction Field Effect Transistor – Operation – Transfer characteristics – Comparison of FET and BJT – MOSFET – Types: Depletion – Enhancement – Drain and transfer characteristics – MOSFET as a resistor – Advantage of N-Channel MOSFET over P-Channel.	12
<b>Unit V</b>	<b>Thyristors</b> Overview – Construction and Working: Silicon Controlled Rectifier(SCR) – TRIAC – DIAC – Unijunction Transistor (UJT): Operation – UJT relaxation oscillator – Silicon Controlled Switch (SCS) – Silicon Unilateral Switch (SUS) – Silicon Bilateral Switch (SBS).	12

**Text Books:**

1. V.K. Mehta, "Principles of Electronics", S.Chand, 1997. (Unit-I, II & III).
2. R.S. Sedha, "A Text Book of Applied Electronics", S.Chand, 3<sup>rd</sup> Revised Edition, 2008. (Unit-IV & V).

**Reference Books:**

1. B.L. Theraja "Basic Electronics Solid State", S.Chand, 1998.
2. S. Salivahanan, N. Suresh Kumar & A. Vallavaraj, "Electronics Devices and Circuits", Tata McGraw Hill Publishing Company Limited, New Delhi, 8<sup>th</sup> edition.
3. S.M.Sze, "Semiconductor Devices: Physics and Technology", Wiley India (P.) Ltd, Second Edition, 2008.

  
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Code No.	Subject	Semester No.
17ELU05	PRACTICAL I: PRINCIPLES OF ELECTRONICS LAB	II

(Any 18 Experiments)

1. Familiarization of components: Active & Passive - identification (colour coding), specification and testing using Multimeter.
2. Measurement of Amplitude, Frequency & Phase difference using CRO.
3. Verification of Ohm's Law.
4. Voltage sources in series, parallel and series & parallel.
5. Resistors in series, parallel and series & parallel.
6. Capacitors and Inductors in series, parallel and series & parallel.
7. Verification of Kirchhoff's Law.
8. Verification of Voltage Divider Rule.
9. Verification of Current Divider Rule.
10. Verification of Superposition Theorem.
11. Verification of Thevenin's Theorem.
12. Verification of Norton's Theorem.
13. Verification of Millman's Theorem.
14. Verification of Maximum Power Transfer Theorem.
15. Series Resonance Circuit.
16. Parallel Resonance Circuit.
17. RC Low Pass Filter.
18. RC High Pass Filter
19. RC Band Pass Filter.
20. RC Band Rejection Filter.
21. Transient response of RC Circuit.
22. Transient response of RL Circuit.
23. Frequency response of R, L & C.
24. Wheatstone Bridge.
25. LCR Bridge.

Code No.	Subject	Semester No.
17ELU06	PRACTICAL II: SEMICONDUCTOR DEVICES LAB	II

(Any 18 Experiments)

1. Band Gap Energy of Silicon / Germanium Diode.
2. Temperature Co-efficient of Junction Diode.
3. Characteristics of PN Junction Diode.
4. Characteristics of Zener Diode.
5. Characteristics of Light Emitting Diode.
6. Common Emitter (CE) Characteristics of Transistor.
7. Common Base (CB) Characteristics of Transistor.
8. Common Collector (CC) Characteristics of Transistor.
9. Transistor Biasing Circuits.
10. Transistor as a Switch.
11. Characteristics of JFET.
12. Characteristics of MOSFET
13. Characteristics of SCR.
14. Characteristics of TRIAC.
15. Characteristics of DIAC.
16. Characteristics of UJT.
17. UJT Relaxation Oscillator.
18. Zener Diode as Voltage Regulator.
19. FET as Voltage Variable Resistor (VVR).
20. Measurement of stability factor of Fixed Bias.
21. Measurement of stability factor of Self Bias.
22. Characteristics of LDR.
23. Characteristics of Solar Cell.
24. Study of IR Transmitter & Receiver.
25. Study of Seven Segment Display.

Code No.	Subject	Semester No.
17ELU07	PRINCIPLES OF COMMUNICATION SYSTEM	III
<b>Objective:</b>	To equip and enable the students to learn the basic principles used in Electronic Communication Systems.	
Unit No	Topics	Hours
Unit I	<b>Radio Wave Propagation and Antennas</b> Electromagnetic Radiation – Ground Wave, Sky Wave and Space Wave Propagation – Radiation Mechanism – Elementary Doublet – Resonant and Non resonant Antenna – Terms and Definitions of Antennas – Dipole Array – Folded Dipole – Parabolic Reflector – Horn Antenna – Lens Antenna – Helical Antenna – Discone Antenna – Log Periodic and Loop Antennas.	12
Unit II	<b>Amplitude Modulation</b> Introduction – Need of Modulation – External Noise – Internal Noise – Noise Figure – Noise Temperature. Amplitude Modulation: Theory – Frequency Spectrum – Representation – Bandwidth and Power Relation. AM Generation: Balanced Modulator – Filter Method, Phase-Shift Method and Third Method of AM generation – Independent Sideband System – Vestigial Sideband Transmission.	12
Unit III	<b>Frequency and Phase Modulation</b> Frequency Modulation: Theory – Mathematical Representation – Frequency Spectrum – Bandwidth and Power Relation – Phase Modulation – Pre-emphasis and De-Emphasis Comparison of Wide and narrow Band FM. FM Generation: Direct Method – Stabilized Reactance Method – Armstrong Method.	12
Unit IV	<b>Radio Receivers</b> Tuned Radio Frequency (TRF) Receivers – Super heterodyne Receiver – AM Receivers: RF Section – Frequency Changing and tracking – IF Amplifiers – Detectors and AGC – Basic Block diagram of AM receiver. FM Receivers: Basic Block Diagram – Comparison of FM receiver with AM receiver – Amplitude Limiting – FM Demodulators – Slope Detection – Balanced Slope Detection – Phase Discriminator – Ratio Detector – SSB Receiver – ISB Receiver.	12
Unit V	<b>Pulse and Digital Modulation</b> Pulse Amplitude Modulation – Pulse Width Modulation – Pulse Position Modulation – Pulse Code Modulation – Differential PCM – Delta Modulation – Quantization Noise – ASK – FSK – PSK – BPSK – QAM and QPSK.	12

**Text Books:**

1. George Kennedy, "Electronic Communication Systems", Tata McGraw- Hill. (Unit I, II, III and IV)
2. Harold Kolimbris, "Digital Communication Systems with Satellite and Fiber Optics Applications", Pearson Education, Third Indian Reprint, 2004. (Unit-V)

**Reference Books:**

1. Herbert Taub, Donald L Scilling and Goutam Saha, "Principles of Communication Systems", Tata McGraw Hill, Third Edition, 2008.
2. Dennis Roddy and John Coolen, "Electronic Communication", Pearson Education, Fourth Edition, 2008.
3. Anokh singh & A.K. Chhabra, "Principles of Communication Engineering", S.Chand & Company Ltd, Sixth Edition, 2007.


Code No.	Subject	Semester No.
17ELU08	<b>DIGITAL ELECTRONICS AND ITS APPLICATIONS</b>	<b>III</b>
<b>Objective:</b>	To equip the students to learn with detailed knowledge in number systems, digital IC's, logic gates, comparators, flip flops, DACs and ADCs.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Number System and Codes</b> Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion – Octal Numbers – Hexadecimal numbers – ASCII codes – Excess three – Gray code – Error Detection and Correction.	<b>12</b>
<b>Unit II</b>	<b>Boolean Algebra and Logic Gates</b> Basic Logic Gates – Universal Logic Gates – AND-OR-Invert Gates – Positive and Negative Logic – Boolean Laws and theorems – SOP – Karnaugh Map Simplifications – Don't care Conditions - POS – POS Simplification.	<b>12</b>
<b>Unit III</b>	<b>Arithmetic Circuits</b> Binary Addition - Binary Subtraction – Unsigned Binary Numbers- Sign-magnitude Numbers – 2's Complement Representation – 2's Complement Arithmetic – Adder-Subtractor – Arithmetic Logic Unit – Binary Multiplication and Division – Multiplexers – De-multiplexers – Decoder-Encoder	<b>12</b>
<b>Unit IV</b>	<b>Sequential Logic Circuits</b> Flip Flops: RS, Clocked RS, D, JK, JK Master Slave and T Flip Flops. Counters: Asynchronous counter – Synchronous counter – Up/Down counter – Modulus counters – Decade counter. Shift Registers: Serial In/Serial Out – Serial In/Parallel Out – Parallel In/Serial Out – Parallel In/Parallel Out.	<b>12</b>
<b>Unit V</b>	<b>D/A and A/D Converters</b> Digital to Analog converters: Weighted Resistor Method – R-2R Ladder Method – Accuracy and Resolution of DAC. Analog to Digital converters: Simultaneous converter – Counter type converter – Continuous type converter – Successive approximation type converter – Dual slope converter – Accuracy and resolution of ADC.	<b>12</b>

**Text Book:**

1. Donald P. Leach, Albert Paul Malvino & Goutam Saha, "Digital Principles and Applications", Tata McGrawHill, 7<sup>th</sup> Edition, 2011.

**Reference Books:**

1. Thomas L. Floyd & R.P.Jain, "Digital Fundamentals", Pearson Education, 8<sup>th</sup> Edition, 2005.
2. M.Morris Mano, "Digital Logic and Computer Design", PHI, 2005.
3. M.Morris Mano, "Digital Design", PHI, 2005.

  
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Code No.	Subject	Semester No.
17ELU09	<b>ELECTRONIC CIRCUITS</b>	<b>III</b>
<b>Objective:</b>	This subject describes the working of rectifiers, filters, voltage regulators, various types of amplifiers & oscillators and to enable the students to become an electronic circuit designer.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Rectifiers, Filters and Voltage Regulators</b> Half wave, Full wave and bridge rectifiers – PIV-DC output voltage – Ripple Factor – Efficiency – Transformer utilization factor – Filters: Inductor Filter – Capacitor Filter – LC Filter – $\pi$ -Filter – Voltage Regulation – Zener Diode Shunt Regulator – Transistor Shunt and Series Regulator – DC Power Supply.	<b>12</b>
<b>Unit II</b>	<b>Single and Multistage Transistor Amplifiers</b> Transistor as an Amplifier – Common Emitter, Common Base and Common Collector Amplifiers – Input Resistance, Output Resistance, Current Gain, Voltage Gain and Power Gain of CE, CB & CC Amplifiers, Gain of Multistage Amplifiers – RC Coupled Amplifier – Impedance Coupled Amplifier – Transformer Coupled Amplifier – Direct Coupled Amplifier – Frequency response, Advantage, disadvantage and Applications – Darlington pair Amplifier.	<b>12</b>
<b>Unit III</b>	<b>Power Amplifiers</b> Performance parameter and AC load line – Classifications – Class A power Amplifier – Class B Power Amplifier – Class B Push-Pull Amplifier – Crossover Distortion – Class C Amplifiers – Characteristics and overall efficiency of Class A, Class B and Class C Power Amplifiers.	<b>12</b>
<b>Unit IV</b>	<b>Feedback Amplifiers</b> Principle of Feedback amplifiers – Types – Advantages and disadvantages negative feedback – Gain stability – Bandwidth– Distortion – Noise – Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedbacks – Comparison of feedback connections – Negative Feedback in transistor amplifier – CE amplifier without emitter bypass capacitor – Emitter Follower – Negative feedback in multistage amplifiers.	<b>12</b>
<b>Unit V</b>	<b>Oscillators and Multivibrators</b> Barkhausen Criterion – Hartley Oscillator – Colpitt's Oscillator – Clapp Oscillator – Quartz crystal – RC Phase Shift – Wien Bridge Oscillators – Astable, Monostable and Bistable Multivibrators – Schmitt Trigger and wave shaping circuits.	<b>12</b>

**Text Book:**

1. R.S. Sedha, "A Text Book of Applied Electronics", 3<sup>rd</sup> Revised Edition, S.Chand, 2008.

**Reference Books:**

1. S.K. Sahdev, "Electronic Principles", Dhanpat Rai & Co (P) Ltd, 2nd Edition, 1998.
2. B.L. Theraja, "Basic Electronics Solid State", S.Chand Company Ltd., 2000.
3. S.Salivahanan, N.Suresh Kumar & A.Vallavaraj, "Electronic Devices and Circuits", Tata Mc Graw Hill, Second Edition, 2008.

  
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Code No.	Subject	Semester No.
17ELU10	PROGRAMMING IN C	III
<b>Objective:</b>	On successful completion of this subject the students have the programming ability in C Language.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Introduction</b> Overview of C – Names – Data types and Qualifiers – Constant – variables – Assignment of variables – Variable Initialization. Operators: Arithmetic, Assignment, Relational, Logical, Bitwise, Conditional, Compound assignment, Unary and other operators – Order of precedence and associativity of operators.	9
<b>Unit II</b>	<b>Program Control Constructs</b> Conditional & multiple branching iteration – Jump constructs – Console input and output: Console I/O Functions – getch, putch, getchar, putchar, gets puts, print, and scan functions – Formatted I/O . Functions: Definition– prototype – recursion – simple programs.	9
<b>Unit III</b>	<b>Arrays</b> Initializations – Multidimensional arrays – character arrays. Pointers: Declaration and initialization of pointer variables – Pointers and Functions – Pointers and arrays – Pointers and strings – Arrays of pointers and pointer to an array – Command line arguments – Dynamic memory allocation.	9
<b>Unit IV</b>	<b>Structures &amp; Unions</b> Definition & initializing structure variables – Array of structures – Pointer to structures – Array of pointers structures – Passing structures to functions – bit fields – Union.	9
<b>Unit V</b>	<b>Files</b> File structure – Opening & closing of files – Character functions – Line I/O functions – Formatted I/O functions – Block I/O functions. Preprocessor directive: file inclusion – Macro substitution – Conditional compilation.	9

**Text Book:**

1. E.Balagurusamy, "Programming in ANSI C", Tata McGraw-Hill, 2004.

**Reference Books:**

1. Yashavant P. Kanetkar, "Let us C", BPB Publications, 14<sup>th</sup> Edition, 2016.
2. Stephen G. Kochan, "Programming in C", Addison-Wesley, Fourth Edition, 2015.
3. Rajaraman.V, "Computer Programming in C", Prentice-Hall of India Private Limited, Sixteenth Printing, 2006.

  
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Code No.	Subject	Semester No.
17ELU11	PRACTICAL III: C PROGRAMMING LAB	III

(Any 10 Experiments)

1. Find the sum, average, standard deviation for a given set of numbers.
2. Generate n prime numbers.
3. Generate Fibonacci series.
4. Find the greatest among the Three Numbers.
5. Check Whether the Given Number is Armstrong Number or Not.
6. Find the Sum of Given All Digits.
7. Find the Given Number is Prime or not.
8. Find the given number is odd or even.
9. Matrix Addition, Subtraction and Multiplication.
10. Sort the given set of numbers in ascending order.
11. Check whether the given string is a palindrome or not using Pointers.
12. Count the number of Vowels in the given sentence.
13. Find the factorial of a given number using recursive function.
14. Print the students Mark sheet assuming roll no, name, and marks in five subjects in a structure. Create an array of structures and print the mark sheet in the university pattern.
15. Write a function using pointers to add two matrices.

  
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Code No.	Subject	Semester No.
17ELU12	MICROWAVE AND FIBER OPTIC COMMUNICATION	IV
<b>Objective:</b>	To learn the basics of Wave Guides, fundamentals of Electromagnetic Waves & Microwaves, Concepts of Optical Fibers, the principles of Optical sensors and its Applications.	
Unit No	Topics	Hours
Unit I	<b>Microwave and Electromagnetics</b> Microwave region and band designations - Advantages & Applications of Microwave – Electro Magnetic wave principles – Maxwell’s Equations: Amperes Law – Faraday’s Law – Gauss’s Law – Wave Equations – TEM/TE/TM/HE wave definitions.	10
Unit II	<b>Waveguides</b> Propagation of Waves and Rectangular waveguide – Propagation of TEM waves – TE and TM Modes- Propagation of TM waves and Rectangular waveguide – Propagation of TE waves and Rectangular waveguide – TE, TM modes in rectangular waveguide.	12
Unit III	<b>Microwave Components, Instruments and Microwave Tubes</b> Overview of Microwave Components, Measurement devices and instruments – Two Cavity Klystron Amplifier – Multicavity Klystron – Two Cavity Klystron Oscillator – Reflex Klystron – Travelling Wave Tube – Backward Wave Oscillator – Magnetrons.	14
Unit IV	<b>Optical Fibers And Their Properties</b> Introduction to Optical Fiber – Basic Structure of Optical Fiber – Total Internal Reflection – Principles of light propagation – Types of fibers: Step Index & Graded Index fibers. Modes of Propagation: Single and Multimode fibers – Acceptance Angle – Numerical Aperture – Advantage and Application.	12
Unit V	<b>Light Sources &amp; Photo Detectors</b> Light Sources: LED - Fibre LED Coupling – LASERS. Photo Detectors: Characteristics – Photo Emissive Type – Photo Conductive – Photo Voltaic Devices – PIN Photo diode – Avalanche Photo Diode. Application: ADM – CATV – Digital Video Transmission.	12

**Text Books:**

1. M.Kulkarni, "Microwave and Radar Engineering", Umesh Publications, 2<sup>nd</sup> Edition, 2009.
2. Subir Kumar Sarkar, "Optical Fibers and Fiber Optic Communication Systems", S. Chand Publication, 2<sup>nd</sup> Edition 2001.

**Reference Books:**

1. Annapurna Das & Sisir K. Das, "Microwave Engineering", Tata McGraw Hill Publications, 2<sup>nd</sup> Edition, 2009.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4<sup>th</sup> Edition, 10th Reprint, 2011.
3. Samuel Y. Liao, "Microwave Devices and Circuits", Pearson Education, Third Edition, 2008.

  
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Code No.	Subject	Semester No.
17ELU13	<b>INTEGRATED CIRCUITS AND INSTRUMENTATION</b>	<b>IV</b>
<b>Objective:</b>	To learn the basics of IC fabrication techniques and to equip the students with detailed knowledge of various analog IC's, Transducers and basic electronic instruments.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>IC Fabrication Technology</b> Introduction – Fundamentals of Monolithic IC technology – Basic planar process – Wafer preparation – Epitaxial growth – Oxidation – Photolithography – Diffusion of impurities – Isolation techniques – Metallization – Monolithic transistors –Integrated resistors – Integrated capacitors – Integrated inductors – Thin and Thick Film Technology.	<b>12</b>
<b>Unit II</b>	<b>Operational Amplifier</b> Op-Amp Non-Inverting and Inverting Amplifiers – Instrumentation Amplifier – V to I and I to V Converters –Differentiator and Integrator – Sample and Hold Circuits – Log and Antilog Amplifiers– Comparators – Square Wave Generator – Monostable Multivibrator – Triangle Wave Generator – Saw-tooth Wave Generator – Phase Shift Oscillator – Wien Bridge Oscillator .	<b>12</b>
<b>Unit III</b>	<b>Timer and PLL</b> Block diagram of Timer (NE555) – Monostable Operation. Applications of Monostable Mode – Astable Operation – Applications of Astable Mode– Basic Principle of PLL – Phase Detector – VCO – Low Pass Filter– Monolithic PLL NE 565 – PLL Applications – Voltage Controlled Oscillator (LM566).	<b>12</b>
<b>Unit IV</b>	<b>Transducers</b> Electrical Transducer – Advantages – Classifications – Characteristics and Choice of Transducer – Resistive Transducers – Potentiometers – Strain Gauge – Thermistors – Thermocouples – Variable Inductance Transducer– LVDT – RVDT – Capacitive Transducer – Piezoelectric Transducers – Hall Effect Transducers – Optoelectronic Transducers.	<b>12</b>
<b>Unit V</b>	<b>Electronic Instruments</b> Q Meters- CRO: Block Diagram – Cathode Ray Tube – Measurement of Frequency – Measurement of Voltage and Current – Digital Oscilloscope– Digital Voltmeter: Ramp Type DVM – Dual Slope Integrating type DVM – Digital Multimeter – Humidity Measurement – Measurement of PH.	<b>12</b>

**Text Books:**

1. D. Roy Choudhury & Shail B. Jain, "Linear Integrated Circuits" New Age International, 2004. (Unit- I,II & III)
2. J.B.Gupta "A Course in Electronic and Electrical Measurements and Instrumentation", S.K Kataria & sons, 12th Edition. (Unit -IV & V)

**Reference Books:**

1. K.R.Botkar, "Integrated Circuits", Khanna Publishers, 1991.
2. Ramakant A.Gayakwad, "Op-Amps and Linear Integrated Circuits", PHI, 2<sup>nd</sup> Edition, 1991.
3. H.S. Kalsi, "Electronic Instrumentation", Tata McGraw Hill Publication Company Limited, Sixth Reprint, 2006.

  
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Code No.	Subject	Semester No.
17ELU14	PCB DESIGN AND FABRICATION	IV
Objective:	To enable the students to learn the design concept of PCB and become familiarize in PCB fabrication techniques.	
Unit No	Topics	Hours
Unit I	<b>Types of PCB</b> Single sided board – double sided – Multilayer boards – Plated through holes technology – Benefits of Surface Mount Technology (SMT) – Limitation of SMT – Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.	12
Unit II	<b>Layout and Artwork</b> Layout Planning – General rules of Layout – Resistance, Capacitance and Inductance – Conductor Spacing – Supply and Ground Conductors – Component Placing and mounting – Cooling requirement and package density – Layout check. Basic artwork approaches – Artwork taping guidelines – General artwork rules – Artwork check and Inspection.	12
Unit III	<b>Laminates and Photo Printing</b> Manufacture of copper clad laminates – Properties of laminates – Types of Laminates – Manual cleaning process – Basic printing process for double sided PCB's – Photo resists – wet film resists – Coating process for wet film resists – Exposure and further process for wet film resists – Dry film resists	12
Unit IV	<b>Etching and Soldering</b> Introduction – Etching machine – Etchant system. Soldering: Principles of Solder connection – Solder joints – Solder alloys – Soldering fluxes. Soldering Tools: Soldering, Desoldering tools and Techniques – Man Soldering – Solder mask – Safety, health and medical aspects in Soldering practice.	12
Unit V	<b>Design Rules and Automation</b> Reflection – Crosstalk – Ground and Supply line noise – Electromagnetic interference from pulse type EM fields and automation – Automated artwork drafting – CAD.	12

**Text Book:**

1. Walter C. Bosshart, "PCB Design and Technology", Tata McGraw Hill Publications, Delhi, 2008.

**Reference Books:**

1. Clyde F. Coombs "Printed Circuits Handbook" McGrawhill, 7<sup>th</sup> Edition, 2016.
2. R.G. Gupta "Electronic instruments and system" Tata McGraw Hill Publication. NewDelhi, 2001.
3. Christopher T. Robertson, "Printed Circuit Board Designer's Reference: Basics", Prentice Hall, 2004.

  
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Code No.	Subject	Semester No.
17ELU15	PRACTICAL IV: ELECTRONIC CIRCUITS LAB	IV

(Any 18 Experiments)

1. Half Wave Rectifier.
2. Full Wave Rectifier.
3. Filter Circuits.
4. DC Power Supply Design using IC 78XX and 79XX Series.
5. Clipper Circuit.
6. Clamper Circuit.
7. Voltage doubler.
8. Transistor Biasing Circuit.
9. RC Coupled Amplifier.
10. Transformer Coupled Amplifier.
11. Emitter Follower.
12. Class B Power Amplifier.
13. Class AB Power Amplifier.
14. Feedback Amplifier.
15. RC Phase Shift Oscillator using BJT.
16. RC Phase Shift Oscillator using FET.
17. Wien Bridge Oscillator using BJT.
18. Hartley Oscillator using BJT.
19. Colpitt's Oscillator using BJT.
20. Clapp Oscillator using BJT.
21. Crystal Oscillator.
22. Monostable Multivibrator using BJT.
23. Astable Multivibrator using BJT.
24. Bistable Multivibrator using BJT.
25. Schmitt Trigger using BJT.

  
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Code No.	Subject	Semester No.
17ELU16	PRACTICAL V: ANALOG AND DIGITAL IC LAB	IV


(Any 18 Experiments)

1. Verification of Basic Logic Gates and Universal Gates.
2. Verification of Boolean Laws and Demorgan's Theorem.
3. Parity Generator and Checker.
4. Half Adder and Full Adder.
5. Half Subtractor and Full Subtractor.
6. Multiplexer and De multiplexers.
7. Encoder and Decoder.
8. BCD to 7-Segment Display.
9. Flip Flops.
10. Shift Registers and Ring Counter.
11. Analog to Digital Converter.
12. Digital to Analog Converter.
13. Inverting and Non-inverting Amplifier using Op-Amp.
14. Adder and Subtractor using Op-Amp.
15. Instrumentational Amplifier using Op-Amp.
16. First and Second order Low pass filter using Op-Amp.
17. First and Second order High pass filter using Op-Amp.
18. Band pass filter using Op-Amp.
19. Notch filter using Op-Amp.
20. Phase Shift and Wein Bridge Oscillator using Op-Amp.
21. Square Wave Generator using Op-Amp.
22. Zero crossing detector and Schmitt Trigger using Op-Amp.
23. Monostable Mutivibrator using Timer.
24. Astable Mutivibrator using Timer.
25. Voltage Controlled Oscillator using NE566.

Code No.	Subject	Semester No.
17ELU17	PRACTICAL VI: COMMUNICATION SYSTEMS LAB	IV

(Any 10 Experiments)

1. Amplitude Modulation and Demodulation.
2. Frequency Modulation LM565/NE565.
3. PAM Modulation and Demodulation.
4. PWM Modulation and Demodulation.
5. PPM Modulation and Demodulation.
6. Voltage Controlled Oscillator using Timer.
7. ASK Generation and Detection.
8. FSK Generation and Detection.
9. PSK Generation and Detection.
10. BPSK & DPSK Generation and Detection.
11. QAM Generation and Detection.
12. Pulse Code Modulation and Demodulation.
13. Delta & Adaptive Delta Modulation and Demodulation.
14. Establishment of Analog Fiber Optic Link.
15. Establishment of Digital Fiber Optic Link.

  
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Code No.	Subject	Semester No.
17ELU18	CELLULAR COMMUNICATION SYSTEM	V
<b>Objective:</b>	To enrich the basics of Cellular Communication Techniques to the Students.	
Unit No	Topics	Hours
Unit I	<b>Cellular Mobile System</b> Introduction – Basic Cellular System – Performance criteria – Operation of Cellular System – Analog Cellular System – Digital Cellular System – Elements of Cellular Mobile System Design: Frequency reuse channels – Co-channel interference reduction factor – Handoff Mechanism – Cell Splitting.	13
Unit II	<b>Cell Coverage for Signal and Traffic</b> Mobile Point-to-point Model – Propagation over Water – Foliage loss – Propagation in Near-in Distance – Long distance propagation – Cell site antenna heights and signal coverage cells – Mobile-to-Mobile propagation.	13
Unit III	<b>Frequency Management and Channel Assignment</b> Frequency Management – Frequency Spectrum Utilization – Set-up Channels – Channel Assignment – Fixed Channel Assignment – Non Fixed Channel Assignment – Operate with additional Spectrum – Traffic and Channel Assignment – Perception of Call blocking from the Subscribers.	10
Unit IV	<b>Handoffs and Dropped Calls</b> Implementing Handoffs – Initiation of a Handoff – Delaying a Handoff – Forced Handoffs – Queuing of Handoffs – Power difference Handoffs – Mobile assisted Handoff and Soft Handoff – Cell-site Handoff – Intersystem Handoff – Dropped call rate – Formula of Dropped call rate – Finding the values of $\delta$ and $\mu$ .	12
Unit V	<b>Digital Cellular Systems</b> Global System for Mobile (GSM) – GSM Architecture – Layer modeling– Transmission – Radio resource management – Mobility Management – Communication Management – TDMA Architecture – Transmission and Modulation – CDMA – Terms of CDMA systems – Call processing – Hand over Procedures.	12

**Text Book:**

1. William C.Y.Lee, "Mobile Cellular Telecommunications", McGraw Hill Publications, Second Edition, 2008.

**Reference Books:**

1. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson, 2013.
2. V.Jeyasri Arokiamary, "Cellular and Mobile Communications", Technical Publications Pune, 1<sup>st</sup> Edition, 2009.
3. William C.Y.Lee, "Wireless and Cellular Telecommunications", Tata Mc-Graw Hill, 3<sup>rd</sup> Edition, 2006.

  
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Code No.	Subject	Semester No.
17ELU19	VLSI DESIGN TOOLS	V
<b>Objective:</b>	To impart the concepts of Digital Circuit Design using VHDL and equip the Students to Develop New Digital Systems.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Introduction and Basic Concepts of VHDL</b> History of VHDL – Capabilities of VHDL – Hardware Abstraction – Basic Terminology – Entity Declaration – Architecture Body Declaration– Basic Language Elements – Identifiers – Data Objects– Data Types and Operators.	12
<b>Unit II</b>	<b>Behavioral Modeling Techniques of VHDL</b> Behavioral Modeling: Entity Declaration – Architecture Declaration – Process Statements – Variable Assignment Statements – Signal Assignments Statements – Wait Statement – IF Statement – Case Statement – Null Statement – Loop Statement – Exit Statement – Next Statement – Assertion Statement – Report Statements– More on Signal Assignment Statement – Multiple Process – Postponed Process.	12
<b>Unit III</b>	<b>Data Flow Structural Modeling Techniques of VHDL</b> Data Flow Style of Modeling: Concurrent Signal Assignment Statement Versus Signal Assignment Statement – Delta Delay Revisited – Multiple Drivers – Conditional Signal Assignment Statement – Selected Signal Assignment Statement – Unaffected Value – Block Statement – Concurrent Assertion Statement.	12
<b>Unit IV</b>	<b>Structural Modeling Techniques, Generics &amp; Configuration of VHDL</b> Structural Modeling: Component Declaration – Component Instantiation– Resolving Signal Value – Examples of Structural Modeling– Half Adder– Full Adder – Four to One Multiplexers – Decoders and Encoders. Generics – Configuration – Configuration Specification – Configuration Declaration – Default Rules – Conversion Functions – Direct Instantiation– Incremental Binding	12
<b>Unit V</b>	<b>Advanced Features in VHDL</b> Subprograms – Sub Program Overloading – Operator Overloading – Signatures – Default Value of Parameters – Package Declaration – Package Body – Design File – Design Libraries – Implicit Visibility – Explicit Visibility.	12

**Text Book:**

1. J. Bhaskar, "VHDL Primer", Low price Edition, PHI, 2001.

**Reference Books:**

1. Charles H. Roth & Jr. Lizy Kurian John, "Digital System Design Using VHDL" Cengage Learning.
2. Douglas L. Perry, "VHDL: Programming by Example", Tata McGraw Hill, 4<sup>th</sup> Edition, 2002.
3. Kenneth L. Short, "VHDL for Engineers", Pearson, 1<sup>st</sup> Edition, 2009.

  
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Code No.	Subject	Semester No.
17ELU20	8051 MICROCONTROLLER	V
<b>Objective:</b>	To enable the students to learn the instruction set, programming, and interfacing concepts of 8051 microcontroller.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Overview and Instruction Set</b> Introduction to Computing – Microprocessor and Microcontrollers – Microcontrollers and Embedded Processors – Overview of 8051 Family– 8051 Architecture – Timers – Registers and Memory Organizations.	12
<b>Unit II</b>	<b>8051 Assembly Language Programming</b> Inside the 8051 – Pin Out – Instruction Set: Addressing Modes – Data Transfer Instruction – Logical Instruction– Arithmetic Instructions – Jump and Call Instructions – Bit Oriented Instructions – Flags and Stack.	12
<b>Unit III</b>	<b>Programming with C</b> Data types – Time delay programming – I/O programming – Logic Operations – Arithmetic Operations – Timer Programming – Counter Programming.	12
<b>Unit IV</b>	<b>8051 Interrupts &amp; Peripherals</b> 8051 Interrupts – Programming External Hardware Interrupts – 8051 Serial Communication Programming – Programming with Serial Communication Interrupts – Peripheral and Interrupt Programming in C.	12
<b>Unit V</b>	<b>Real World Applications and Case Studies</b> LCD Interfacing – Keyboard Interfacing – Parallel and Serial ADC Interfacing – DAC Interfacing – Sensor Interfacing and Signal Conditioning – RTC Interfacing – Relays and Opto-Isolator Interfacing – Stepper Motor Interfacing – DC Motor Interfacing and PWM.	12

**Text Book:**

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C", PHI, 2<sup>nd</sup> Edition, 2006.

**Reference Books:**

1. Kenneth J. Ayala, "The 8051 Microcontroller", Delmar Cengage Learning, 3<sup>rd</sup> Edition.
2. D.Karuna Sagar, "Microcontroller 8051", Narosa Publishing House, 2011.
3. A.P. Godse, D.A. Godse, "Microprocessor and Microcontroller", Technical Publications Pune, First Edition, 2007.

  
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Code No.	Subject	Semester No.
17ELU21	PRACTICAL VII: CIRCUIT SIMULATION LAB	V

(Any 10 Experiments)

(Using PSpice/ MULTISIM/ MATLAB/ Proteus/ Lab VIEW/ Equivalent Simulation Software)

1. Voltage and Current Divider
2. Super position Theorem
3. Thevenin's Theorem
4. Norton's Theorem
5. Maximum Power Transfer Theorem
6. Half Wave and Full Wave Rectifier
7. Low Pass and High Pass Filter
8. Band Pass and Band Reject Filter
9. Clipper and Clamper
10. RC Coupled Amplifier
11. RC Phase Oscillator
12. Wien Bridge Oscillator
13. Adder and Subtractor using OPAMP
14. Schmitt Trigger using OPAMP
15. Astable and Monostable Multivibrator

  
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Code No.	Subject	Semester No.
17ELU22	<b>ELECTIVE – I: (A)</b> <b>MEDICAL ELECTRONICS</b>	<b>V</b>
<b>Objective:</b>	To enable the students to learn about the concepts of bio-potentials and bio-medical instruments and also to develop the troubleshooting skills of bio-medical instruments.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Human Physiological Systems</b> Cells and their structure – Transport of potentials – Bio-electric potentials. <b>Bio-potential Electrodes:</b> Design of medical instruments – Components of Bio medical instrument system – Electrodes – Half cell potential – purpose of the electrode paste. Types of electrode: Microelectrode – Depth and Needle electrodes – Surface electrode	9
<b>Unit II</b>	<b>Bio Potential Recorders</b> Characteristics of the recording system – Electrocardiography – Origin of cardiac action potential – ECG lead configurations – ECG recording setup. Practical considerations for ECG recording – Echocardiography. Electroencephalography (EEG): Origin of EEG – Brain waves – Placement of electrodes – Recording setup.	9
<b>Unit III</b>	<b>Diagnostic Equipments</b> Electromyography (EMG): Recording setup – Determination of conduction velocities in motor nerves– Electroretinography (ERG) – Electro Oculography (EOG) – Blood pressure measurement (Indirect methods) – Audio meter – X- ray machine.	9
<b>Unit IV</b>	<b>Biotelemetry</b> X-ray imaging – Radio fluoroscopy – Image Intensifiers – Angiography – Endoscopy – Diathermy. Biotelemetry and Patient Safety: Need for biotelemetry – Elements of telemetry system – Radio telemetry system – Physiological signals used in telemetry – TDM and FDM – Implantable units.	9
<b>Unit V</b>	<b>Physiological Assist Devices</b> Need for Pacemakers – Pacemaker parameters and circuits – Different modes of operation – DC defibrillator – Artificial heart valves – Heart lung machines – Artificial lung machines – Artificial kidney machine – Nerve and Muscle stimulator. Computer Applications: Data acquisition systems – Analysis of ECG signals – Computerized Axial Tomography (CAT) Scanner – Ultrasonic scanner – Magnetic resonance imaging – Computer based patient monitoring system.	9

**Text Books:**

1. Arumugam.M, "Biomedical Instrumentation", Anuradha Agencies Publishers, Chennai, 1992.
2. Khandpur, "Handbook on Biomedical Instrumentation", Tata McGraw Hill Company, New Delhi, 1989.

**Reference Books:**

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education Asia, New Delhi, 4th Edition, 2001.
2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer., "Bio-medical Instrumentation and Measurements", Prentice Hall of India, New Delhi, 1990.
3. John G Webster, Ed., "Medical Instrumentation Application and Design", Third edition, John Wiley & Sons, Singapore, 1999


Code No.	Subject	Semester No.
17ELU22	<b>ELECTIVE – I: (B)</b> <b>CONSUMER ELECTRONICS</b>	V
<b>Objective:</b>	To enable the students to learn about the idea implementation of electronics in consumer products.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Car Computers</b> Electronic Ignition – Electronic Ignition Lock System – Antilock Braking System (ABS) – Electronically controlled suspension (ECS) – Instrument panel displays – Ultrasonic car safety belt system – Air bag system – Vehicle proximity detection systems – car navigation system.	9
<b>Unit II</b>	<b>Microwave Ovens</b> Microwaves – Properties and generation – Microwave oven block diagram – LCD timer with alarm – Controllers Types of Microwave ovens – Microwave Cooking Safety instructions – Care and Cleaning. <b>Washing Machines:</b> Electronic controller for washing machines – Washing machine hardware and software – Types of washing machines: Fuzzy logic washing machines – Features of washing machines.	9
<b>Unit III</b>	<b>Air Conditioners</b> Air Conditioning: Components of air conditioning systems – All water air conditioning systems – All air conditioning systems – Unitary and central air conditioning systems – Split air conditioners. Refrigerators: Refrigeration – Refrigerants – Refrigeration systems – Domestic refrigerators.	9
<b>Unit IV</b>	<b>Home / Office Digital Devices</b> Facsimile machine – Xerographic copier Calculators – Structure of a calculator – Internal Organization of a calculators – Servicing electronic calculators – Digital clocks – Block diagram of a digital clock.	9
<b>Unit V</b>	<b>Digital Access Devices</b> Bar codes – Bar coding – Bar code scanner and decoder – Automated Teller Machines (ATM): Electronic Funds Transfer – Point of sale Terminal – Automated Teller Machines Set-Top Boxes: Interoperable set-top boxes – Middle ware for set-top boxes – Personal Video Recorder – Digital cable TV – Video on demand.	9

**Text Book:**

1. S.P. Bali, "Consumer Electronics", Pearson Education, New Delhi, 2005.

**Reference Books:**

1. J.S.Chitode, "Consumer Electronics", Technical Publications, 2007.
2. Douglas Kinney, "A Beginners Guide to Consumer Electronics Repair: Hand Book and Tutorial", iUniverse, 2006.
3. Philip Hoff, "Consumer Electronics for Engineers", Cambridge University Press, 1998.

  
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Code No.	Subject	Semester No.
17ELU23	SATELLITE AND NETWORK COMMUNICATION	VI
<b>Objective:</b>	To enable the students to learn & enhance the knowledge in satellite and network communication system.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Communication Satellite Orbit and Description</b> History of Satellite Communication – Satellite Frequency Bands – Satellite Systems – Applications – Orbital Period and Velocity – Effects of Orbital Inclination – Azimuth and Elevation – Coverage angle and slant Range – Eclipse – Orbital Perturbations – Placing Satellites into a Geo-Stationary orbit.	12
<b>Unit II</b>	<b>Satellite Sub-Systems</b> Attitude and Orbit Control system – TTC&M Subsystem – Attitude Control Subsystem – Power Systems – Communication subsystems – Satellite Antenna Equipment. Satellite Link: Basic Transmission Theory – System Noise Temperature and G/T ratio – Basic Link Analysis – Interference Analysis – Design of satellite Links for a specified C/N – (With and without frequency Re-use) – Link Budget.	12
<b>Unit III</b>	<b>Data Communication</b> Introduction – Basic Terms and Concepts – Line Configurations – Topology – Transmission Media – MODEM: Standard and Types – Analog and Digital transmission: Encoding and Modulating – Channel Capacity – Base Band and Broad Band – Transmission Impairments – Multiplexing: FDM – TDM – Error Detection and Control: CRC.	12
<b>Unit IV</b>	<b>Network Architecture and Protocols</b> Layered Architecture – OSI model – Functions of Layers – Data Link Control Protocols – ARQ – Stop and Wait – Sliding Window – Go back N and Selective Repeat – Asynchronous Protocol: X Modem – Y Modem– Kermit – Synchronous Protocol: BSC– SDLC – HDLC– TCP/IP Model – SMTP – HTTP – FTP.	12
<b>Unit V</b>	<b>LAN and ISDN</b> LAN: Standard, Protocol – IEEE 802 Standards: ETHERNET – LLC – MAC – CSMA/CD – Token Ring – Token Bus – FDDI –ALOHA– SONET – ISDN: IDN – Channels – User Interfaces – ISDN Layers – Broad Band ISDN – Frame Relay – ATM: Concept and Architecture – ISDN Protocol– Physical Layer Protocol – D-channel Data Link Layer – Layer 3 Protocols– Network Signaling Systems: SS7 Protocol.	12

**Text Books:**

1. Timothy Pratt, Charles Bostian & Jeremy Allnut, "Satellite Communications" John Wiley & Sons, 2<sup>nd</sup> Edition, 2003. (Unit – I&II)
2. Behrouz. A.Forouzan, "Data Communication and Networking", Tata McGraw Hill, 4<sup>th</sup> Edition, 2000. (Unit – III, IV and V)

**Reference Books:**

1. Satellite Communications-Dennis Roddy, McGraw Hill, 2<sup>nd</sup> Edition, 1996.
2. Ulysess Black, "Data Communications and Distributed Networks", 3<sup>rd</sup> Edition, 2012.
3. Ray E.Sheriff & Y.Fun Hu, "Mobile Satellite Communication Network", Wiley-India Edition, 2006.

Code No.	Subject	Semester No.
17ELU24	<b>INDUSTRIAL AND POWER ELECTRONICS</b>	<b>VI</b>
<b>Objective:</b>	To enable the students to learn and design the industrial & power electronic circuits and also to impart knowledge of industrial electronics system design.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Overview of Thyristor</b> Introduction – Symbolic representation – Specifications – Thyristor ratings – Construction – Operating Principle of an SCR – Two transistor analogy of SCR – Comparison of Thyristors with Gas Tubes and Transistors – Construction and Operating principle of DIAC, TRIAC, UJT, SCS, SUS, SBS, LASCR and LASCS.	<b>12</b>
<b>Unit II</b>	<b>Thyristor Triggering and Commutation</b> Methods of triggering a Thyristor: Thermal Triggering – Radiation Triggering – Voltage triggering – dv/dt triggering – Gate triggering. Commutation of a Thyristor: Natural Commutation – Forced Commutation – Thyristor Configurations.	<b>12</b>
<b>Unit III</b>	<b>Inverters and Choppers</b> Inverters: Working Principle – Thyristor based inverters – Series & Parallel inverters – Bridge inverters – Mc-Murray Bedford inverter – Voltage control and Current Source inverters. Choppers: DC Chopper – Single-Thyristor Chopper, Two-Thyristor Chopper, Morgan Chopper Circuit, Step-up Chopper – AC Chopper.	<b>12</b>
<b>Unit IV</b>	<b>Dual Converters and Cycloconverters</b> Dual Converters: Block diagram– Types: Single-phase dual converter – Three-phase dual converter – Non-circulatory current dual converter – circulating current dual converter. Cycloconverters: Block diagram – Types: Single-phase Cycloconverter – Three-phase Cycloconverter.	<b>12</b>
<b>Unit V</b>	<b>Applications of Thyristors</b> Temperature control – Illumination Control – TRIAC as a Three-position static switch – Automatic Street Lighting Circuit using LDR and SCR – Emergency Light using SCR – Automatic Water Level Indicator using SCR – Automatic Battery Charger using SCR – Light operated SCR Alarm – Burglar Alarm Circuit using SCR – Flip-Flop Circuit using SCR.	<b>12</b>

**Text Book:**

1. S.K.Bhattacharya and S. Chatterjee, "Industrial Electronics and Control", Tata McGraw-Hill Publishing Company Limited, 13th Reprint, 2006.

**Reference:**

1. Rashid .M.H, "Power Electronics – Circuits, Devices and Applications", Prentice Hall, Third Edition, 2011.
2. Dr.Bimbhra.P.S, "Power Electronics", Khanna Publishers, Fifth Edition, 2014.
3. <http://nptel.ac.in/courses/108101038>.

  
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Code No.	Subject	Semester No.
17ELU25	EMBEDDED SYSTEMS	VI
<b>Objective:</b>	To enable the students to learn the idea behind the Embedded System.	
Unit No	Topics	Hours
Unit I	<b>Introduction to Embedded Systems</b> Embedded Systems – Processor embedded into the System –Hardware units – Embedded Software in a system – Exemplary Embedded Systems– Embedded SOC and use of VLSI circuit technology – Complex System Designs and Processors – Design Process in Embedded System – Classification of Embedded Systems.	12
Unit II	<b>PIC 16F877 Architecture and Instruction Set</b> Device Overview – Architecture – Memory Organization – Status Register – Option Register – INTCON Register – PCON Register – I/O Ports – Data EEPROM – Instruction Set: Byte Oriented Operations – Bit Oriented Operations – Literal and Control Operations.	12
Unit III	<b>External Interrupts and Timers</b> RB0/INT External interrupt – Timer0 – Compare Mode – Capture Mode– Timer1 External Event Counter – PWM module – Port B - Change interrupts.	12
Unit IV	<b>I/O Ports and Serial Port Interface</b> I/O Ports – Synchronous serial Port Module – Serial Peripheral Interface – I2C Bus Interface – ADC Converter – USART.	12
Unit V	<b>Special Features</b> Configuration Word- Oscillator Configurations – Reset Alternatives – Low power Operation- Low Voltage Serial Programming – Parallel Slave Port.	12

**Text Books:**

1. Raj Kamal, "Embedded Systems – Architecture, Programming and Design", TMH, 2007.
2. John B. Peatman, "Design with PIC Micro Controllers", Pearson Education, 2009.

**Reference:**

1. PIC 16F87X Data book, Microchip Technology Inc, 2001.
2. Muhammad Ali Mazidi, Rolind D. McKinlay and Danny Causey, "PIC Microcontroller and Embedded Systems using Assembly and C for PIC18", Pearson Education, 2013.
3. <http://nptel.ac.in/courses/117104072/>.

  
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Code No.	Subject	Semester No.
17ELU26	PRACTICAL VIII: INDUSTRIAL ELECTRONICS LAB	VI

(Any 18 Experiments)

1. Resistance Triggering of SCR.
2. RC Phase Shift Triggering of SCR.
3. UJT Triggering of SCR.
4. Half Controlled Bridge Rectifier.
5. Power Control using SCR.
6. Automatic Street Light Control using DIAC and TRIAC.
7. Phase Control using TRIAC.
8. AC Motor Control using SCR.
9. Design of Snubber Circuit.
10. Fan Regulator using TRIAC.
11. Thyristor Chopper.
12. Burglar Alarm.
13. Switching Regulators.
14. ON / OFF Relay Control using Opto – coupler.
15. Temperature controller using AD 590/ LM 35.
16. Digital Bidirectional control using TRIAC.
17. Servo Stabilizer.
18. Cycloconverter.
19. Thyristor protection circuit.
20. Light Dimmer.
21. Automatic Battery Charger.
22. Fire Alarm.
23. Power Inverter.
24. Time delay circuit.
25. DC Motor Controller.

  
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Code No.	Subject	Semester No.
17ELU27	PRACTICAL IX: EMBEDDED SYSTEMS LAB	VI

(Any 18 Experiments)

(Using 8051 / PIC16F877 / PIC16F84A)

1. 16-bit Addition.
2. 8-bit Array Addition.
3. Subtraction of 8-bit and 16-bit Numbers.
4. Square root of array of number.
5. Factorial of array of number.
6. Sort an array in an Ascending and descending order.
7. Largest/Smallest number among the array of data.
8. Generate the Fibonacci series.
9. Find odd/ even number.
10. Arithmetic and Logic Operations.
11. Data transfer with parallel port.
12. Time Delay generation using internal timer.
13. PWM Generation.
14. Object Counter.
15. Interfacing Matrix Keypad.
16. LCD Interface.
17. ADC Interface.
18. DAC Interface.
19. Solid State Relay Interface.
20. Seven Segment Display Interface.
21. Traffic Light Controller.
22. Water level controller.
23. Stepper Motor Interface.
24. Serial Communication.
25. Digital Clock.

  
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Code No.	Subject	Semester No.
17ELU28	<b>ELECTIVE – II: (A)</b> <b>ROBOTICS AND AUTOMATION</b>	<b>VI</b>
<b>Objective:</b>	To introduce the basic concepts, parts & types of robots and to make the student familiar with sensors & their applications in robots and programming of robots.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Introduction to Robotics</b> History – Laws of robotics – Robot definition – Robot usage rules – Applications– Robot subsystems: Manipulators – End effectors – Actuators – Transmissions – Sensors and controllers – Classification of robots: Cartesian robot – Cylindrical robot – Spherical robot – Articulated robot.	12
<b>Unit II</b>	<b>Sensors in Robotics</b> Requirements of a sensor – Tactile sensors – Temperature sensors – LVDT Sensor – High Resolution Pneumatic tactile Sensor – Slip type Sensors – Piezo electric Contact Sensors – Remote Sensor – Compliance– Range and Proximity Sensors – Electro-optical Sensors – CCD Camera.	12
<b>Unit III</b>	<b>Actuators</b> Electrical actuator systems: Solenoids – Relays – Solid state switches – DC Motors – AC motors – Servo motor and stepper motor – Vacuum grippers – Mechanical gripper – Magnetic gripper – Mechanical actuator systems: Involving linkages – Gears – Ratchet and pawl – Belt and chain drives – Bearings.	12
<b>Unit IV</b>	<b>Electronics for robot</b> Introduction to Microcontrollers – The Arduino Platform – Arduino Board– Arduino Family – Fundamentals of Arduino Programming – Keywords – Inbuilt functions – Libraries – Digital GPIO programming – Working with pins as input and output – Working with PWM Outputs – Working with Analog Inputs using on-chip ADC – Serial Communication between Arduino hardware and PC – Arduino Interrupt Programming.	12
<b>Unit V</b>	<b>Robot Applications</b> Blinking of LED – LED brightness control using PWM – Motor Direction Control – Motor Speed Control using PWM – Name display in LCD – IR sensor Interface – Ultrasonic sensors interface – Tone generation – Line follower Robot – Obstacle avoider Robot – Never Falling Robot – Wireless Robot – PC control Robot.	12

**Text Books:**

1. Saha, S.K., "Introduction to Robotics", 2nd Edition, McGraw-Hill Education, New Delhi, 2014.
2. S.R. Deb, "Robotics Technology and Flexible Automation", 2nd edition, Tata McGraw Hill, New Delhi.
3. Michael McRoberts, "Beginning Arduino", 2nd edition, Apress, 2013.
4. John-David Warren, Josh Adams, Harald Molle, "Arduino Robotics", Apress, 2011.

**Reference:**

1. Maja J. Mataric, "The Robotics Primer", MIT Press, 2007.
2. B. R.Mittle, I.Nagrath, "Robotics and Control", Tata McGraw-Hill Education, 2003.
3. <http://www.nptel.ac.in/courses/112102011/11>.
4. <http://nptel.ac.in/courses/112101099/>.
5. D. <http://nptel.ac.in/courses/112108093/>.

  
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Code No.	Subject	Semester No.
17ELU28	<b>ELECTIVE – II: (B)</b> <b>AUTOMOTIVE ELECTRONICS</b>	<b>VI</b>
<b>Objective:</b>	To enable the students to get knowledge in automotive components, operating & working principle.	
Unit No	Topics	Hours
<b>Unit I</b>	<b>Introduction</b> System approach – Electrical Wiring, Terminals and Switching – Multiplexed Wiring Systems – Circuit Diagrams and Symbols. Charging Systems and Starting Systems: Charging System Principles – Alternators and Charging Circuits – New Developments. Requirements of the Starting System – Starter motor and Circuits.	12
<b>Unit II</b>	<b>Ignition Systems</b> Ignition fundamentals – Electronic Ignition – Programmed Ignition – Distributorless Ignition – Direct Ignition – Spark Plugs. Electronic Fuel Control: Basics of Combustion – Engine Fuelling and Exhaust Emissions– Electronic Control of Carburation – Petrol Fuel Injection – Diesel Fuel Injection.	12
<b>Unit III</b>	<b>Instrumentation Systems</b> Introduction to Instrumentation Systems – Various Sensors used for Different Parameters – Sensing Driver Instrumentation Systems – Vehicle Condition Monitoring Trip Computer – Different Types of Visual Display.	12
<b>Unit IV</b>	<b>Electronic Control of Braking and Traction</b> Description Control Elements and Control Methodology – Electronic Control of Automatic Transmission: Introduction and Description Control of Gear Shift and Torque Converter Lockup – Electric Power Steering – Electronic Clutch.	12
<b>Unit V</b>	<b>Engine Management Systems</b> Combined Ignition and Fuel Management Systems – Exhaust Emission Control – Digital Control Techniques – Complete Vehicle Control Systems – Artificial Intelligence and Engine Management – Automotive Microprocessor uses. Lighting and Security Systems: Vehicles Lighting Circuits – Signaling Circuit – Central Locking and Electric Windows Security Systems – Airbags and Seat Belt tensioners – Miscellaneous Safety and Comfort Systems.	12

**Text Book:**

1. Tom Denton, "Automobile Electrical and Electronic Systems", Edward Arnold pb., 1995.

**Reference Books:**

1. Don Knowles, "Automotive Electronic and Computer controlled Ignition Systems", Don Knowles, Prentice Hall, Englewood Cliffs, New Jersey 1988.
2. William, T.M., "Automotive Mechanics", McGraw Hill Book Co.,
3. William, T.M., "Automotive Electronic Systems", Heiemann Ltd., London, 1978.
4. Ronald K Jurgen, "Automotive Electronics Handbook", McGraw Hill, Inc, 1999.

  
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