

**DEPARTMENT OF ELECTRONICS ENGINEERING**



**ELECTRONICS ENGINEERING PROGRAMME**

**(SANDWICH PATTERN)**

**CURRICULUM DOCUMENT (REVISION 2019)**

**(First Semester)**

**GOVERNMENT POLYTECHNIC MUMBAI**

**(An Autonomous Institute, Government of Maharashtra)**

**GOVERNMENT POLYTECHNIC MUMBAI**  
(Academically Autonomously Institute, Government of Maharashtra)

**Teaching and Examination Scheme(P19)**  
**With effect from Academic Year 2019-20**

**Programme: Electronics Engineering (Sandwich Pattern)**

Semester	Teaching scheme						Examination Scheme						
							Theory			PR	OR	TW	TOTAL
	L	P	TU	SCA	TOTAL	CREDITS	TH	TS1	TS2				
<b>First</b>	16	14	0	5	35	<b>30</b>	240	80	80	50	100	150	700
<b>Second</b>	16	14	0	5	35	<b>30</b>	300	100	100	75	25	100	700
<b>Third</b>	14	16	0	5	35	<b>30</b>	240	80	80	125	50	125	700
<b>Fourth</b>	19	14	2	0	35	<b>35</b>	240	80	80	100	100	200	800
<b>Fifth</b>	13	22	0	0	35	<b>35</b>	180	60	60	50	200	250	800
<b>Sixth</b>	0	40	0	0	40	<b>20</b>	0	0	0	0	100	100	200
<b>Total</b>	<b>78</b>	<b>120</b>	<b>2</b>	<b>15</b>	<b>215</b>	<b>180</b>	<b>1200</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>575</b>	<b>925</b>	<b>3900</b>
	<b>78</b>	<b>122</b>					<b>2000</b>			<b>1900</b>			<b>3900</b>
<b>%</b>	<b>39</b>	<b>61</b>					<b>%</b>	<b>51.28205128</b>			<b>48.71794872</b>		

**GOVERNMENT POLYTECHNIC MUMBAI**  
 (Academically Autonomously Institute, Government of Maharashtra)  
**Teaching and Examination Scheme(P19)**  
**With effect from AY 2019-20**

**Programme: Diploma in Electronics Engineering (Sandwich Pattern) Term / Semester - I**

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
		L	P	TU	Total		Theory			PR	OR	TW	Total
							TH	TS1	TS2				
HU19101	Communication Skills	02	02	--	04	04	60	20	20	25 *	--	25	150
EC19201	Electronics Components and Workshop	03	04	--	07	07	--	--	--	--	50	50	100
SC19109	Basic Mathematics	04	--	--	04	04	60	20	20	--	--	--	100
SC19104	Physics	03	02	--	05	05	60	20	20	25*	--	25	150
EE19210	Fundamentals of Electrical Engineering	04	02	--	06	06	60	20	20	--	50	50	200
EC19202	Libre office Impress on BOSS Linux	--	04 #	--	04	04	--	--	--	--	--	--	--
		<b>16</b>	<b>14</b>	<b>--</b>	<b>30</b>	<b>30</b>	<b>240</b>	<b>80</b>	<b>80</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>700</b>
Student Centered activity					<b>05</b>								
Total Contact Hours					<b>35</b>								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

\* Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour, TH- 2 hours, PR/OR – 3 hours per batch, SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours

Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Co-Ordinator  
 Curriculum Development,  
 Department of Electronics

Head of Department  
 Department of Electronics,

In-Charge  
 Curriculum Development Cell

Principal

Programme : <b>Diploma in CE/ME/IT/CO/IS/EE/EC/LG/LT (Sandwich Pattern)</b>										
Course Code: <b>HU19101</b>				Course Title: <b>Communication Skills</b>						
Compulsory / Optional: <b>Compulsory</b>										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs. 30 Min.)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>02</b>	<b>02</b>	<b>-</b>	<b>04</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>25*</b>	<b>-</b>	<b>25</b>	<b>150</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

**Note:** For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

**Rationale:** Communication skills play a vital and decisive role in career development. In this age of globalization, competition is tough. Hence effective communication skills are important. The subject Communication Skills introduces basic concepts of communication. It also describes the verbal, non-verbal modes and techniques of oral & written communication.

In this context, it will help the engineering diploma students to select and apply the appropriate methods of communication in various situations and business communication. Students are also required basics of communication and use of different skills.

This course will guide and direct to develop a good personality and improve communication skills. It will enable the students to utilize the skills necessary to be a competent communicator.

**Course Outcomes:** Student should be able to

<b>CO1</b>	Apply proper communication technique to cope up with the challenges of the modern world.
<b>CO2</b>	Interpret feedback at various situations by using appropriate body language and avoid the barriers in effective communication.
<b>CO3</b>	Able to participate in Group Discussion and Acquire the practical knowledge of an interview.
<b>CO4</b>	Able to develop PowerPoint Presentation and Business correspondence.
<b>CO5</b>	Write letters, circulars, memos, notices, reports and communicate effectively in written communication.

**Course Content Details:**

<b>Unit No</b>	<b>Topics / Sub-topics</b>
<b>1</b>	<p><b>Introduction to Communication</b>            1.1 Elements of Communication            1.2 Communication Cycle            1.3 Types of communication            1.4 Definition and Types of Barriers-                a) Mechanical                b) Physical                c) Language                d) Psychological            1.5 How to overcome Barriers</p> <p><b>Course Outcome: CO1      Teaching Hours :6 hrs      Marks: 14 (R- 2, U-4, A-8)</b></p>
<b>2</b>	<p><b>Non- verbal Communication</b>            2.1 Meaning and Importance of Non-verbal Communication            2.2 Body Language            2.3 Aspects of Body Language            2.4 Graphic language</p> <p><b>Course Outcome: CO2      Teaching Hours :6 hrs      Marks: 12 (R- 4, U-4, A-4)</b></p>
<b>3</b>	<p><b>Group Discussion And Interview Skills</b>            3.1 Need and Importance of Group Discussion            3.2 Use of Knowledge and Logical sequence.            3.3 Types of Interview            3.4 Preparing for an Interview</p> <p><b>Course Outcome: CO3      Teaching Hours :6 hrs      Marks: 10 (R-2, U-4, A-4)</b></p>
<b>4</b>	<p><b>Presentation Skills</b>            4.1 Presentation Skills - Tips for effective presentation            4.2 Guidelines for developing PowerPoint presentation</p> <p><b>Course Outcome: CO4      Teaching Hours :4 hrs      Marks: 08 (R- 2, U-2, A-4)</b></p>
<b>5</b>	<p><b>Business Correspondence</b>            5.1 Office Drafting – a) Notice b) Circular c) Memo                d) Email-writing.            5.2 Job Application with resume.            5.3 Business Letters – a) Enquiry b) Order c) Complaint            5.4 Report Writing – a) Fall in Production b) Accident Report</p> <p><b>Course Outcome: CO5      Teaching Hours: 8 hrs      Marks: 16 (R- 4, U-4, A-8)</b></p>

**List of experiments: Any 10 experiments out of 15**

Sr. No.	Unit No	COs	List of Experiments	Hours
1	1	CO1,CO4	Conversation between students on various situations.	02
2	3	CO2,CO4	Non- Verbal Communication.	02
3	3	CO3,CO4	Group Discussion	02
4	4	CO3,CO4	Mock Interview	02
5	5	CO4,CO5	Business Communication a) Advertisement, Tender, Diary writing. b) Job Application With Resume.	02
6	1	CO1	Communication Barriers	02
7	5	CO5	Business Letters – a) Enquiry b)Order c)Complaint	02
8	4	CO1,CO4	Speeches- a)Welcome Speech b)Farewell Speech c) Vote of Thanks	02
9	5	CO5	Report Writing – a) Fall in Production b) Accident Report	02
10	All	CO4	Showing Videos on different types of Communication.	02
11		CO1	*Articles	02
12		CO1	*Preposition and Conjunction	02
13		CO1	*Direct Indirect Speech	02
14		CO1	*Change the voice	02
15		CO1	*Vocabulary Building	02
			<b>Total</b>	<b>30</b>

**Note:** Experiments No.1 to 10 are compulsory. Remaining experiments are to be performed on availability of time.\* These experiments will be performed during practical hours only.

**References/ Books:**

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Communication Skills	Joyeeta Bhattacharya - Reliable Series	9780000176981, 0000176982
2	Communication Skills	Sanjay Kumar, PushpaLata- Oxford University Press	13: 978-0199488803
3	Successful presentation Skills	Andrew Brad bury- The Sunday Times	13: 9780749456627

**E-References:**

- 1) Website: [www.mindtools.com/page8.html-99k](http://www.mindtools.com/page8.html-99k)
- 2) Website: [www.inc.com/guides/growth/23032.html-4](http://www.inc.com/guides/growth/23032.html-4)
- 3) Website: [www.khake.com/page66htm/-72k](http://www.khake.com/page66htm/-72k)
- 4) Website: [www.BMConsultantIndiaConsultantIndia.Com](http://www.BMConsultantIndiaConsultantIndia.Com)
- 5) <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-English>
- 6) MYCBSEGUIDE
- 7) Website: [www.letstak.co.in](http://www.letstak.co.in)
- 8) <https://learnenglishteens.britishcouncil.org/>

**CO Vs PO and CO Vs PSO Mapping (Civil Engineering)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	1
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	2	1
CO4	3	3	2	1	2	3	2	1	2	
CO5	3	3	2	1	2	3	2	1	2	

**CO Vs PO and CO Vs PSO Mapping (Mechanical Engineering)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	2	3	2	3	2	2	1
CO2	3	3	2	3	2	3	2	2	1
CO3	3	2	2	1	2	3	2	2	1
CO4	3	3	2	1	2	3	2	2	1
CO5	3	3	2	1	2	3	2	2	1

**CO Vs PO and CO Vs PSO Mapping (Electronics Engineering)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	1	1
CO4	3	3	2	1	2	3	2	1		
CO5	3	3	2	1	2	3	2	1		

**CO Vs PO and CO Vs PSO Mapping (Electrical Engineering)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	3
CO2	3	3	2	3	2	3	2	2		3
CO3	3	2	2	1	2	3	2	2		3
CO4	3	3	2	1	2	3	2	1		2
CO5	3	3	2	1	2	3	2			

**CO Vs PO and CO Vs PSO Mapping (Instrumentation Engineering)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	2	3	2	3	2	1	2
CO2	3	3	2	3	2	3	2	1	2
CO3	3	2	2	1	2	3	2	1	2
CO4	3	3	2	1	2	3	2		2
CO5	3	3	2	1	2	3	2		

**CO Vs PO and CO Vs PSO Mapping (Computer Engineering)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1	2	1
CO2	3	3	2	3	2	3	2	1	2	1
CO3	3	2	2	1	2	3	2	1	2	1
CO4	3	3	2	1	2	3	2		2	
CO5	3	3	2	1	2	3	2		2	

**COVs PO and CO Vs PSO Mapping (Information Technology)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	1	1
CO2	3	3	2	3	2	3	2	2	1	1
CO3	3	2	2	1	2	3	2	1		2
CO4	3	3	2	1	2	3	2	1		
CO5	3	3	2	1	2	3	2	1		

**CO Vs PO and CO Vs PSO Mapping (LG/LT Engineering)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	1		2
CO2	3	3	2	3	2	3	2	1		2
CO3	3	2	2	1	2	3	2	1	1	2
CO4	3	3	2	1	2	3	2	1		2
CO5	3	3	2	1	2	3	2	1		2

**Industry Consultation Committee:**

Sr. No	Name	Designation	Institute/Organisation
1	Neelamkumar R. Sawant	State Head Technical Services for (Maharashtra and Goa)	JSW Cement Ltd. Mumbai Head Office
2	Ms Shilpa D. Khune	Corporate Consultant Trainer	Mahindra Pride Classroom
3	Mrs.S.S. Kulkarni	Lecturer in English	Government Polytechnic Pune
4	Mrs. K.S.Pawar	Lecturer in English	Government polytechnic Mumbai
5	Ms.N.N.Dhake	Lecturer in English	Government polytechnic Mumbai

Coordinator,

Head of Department

Curriculum Development,  
Department of Science And Humanities

Department of Science And Humanities

I/C, Curriculum Development Cell

Principal



Programme : <b>Diploma in Electronics Engineering (Sandwich Pattern)</b>										
Course Code: <b>EC19201</b>				Course Title: <b>Electronic Components and Workshop</b>						
Compulsory / Optional: <b>Compulsory</b>										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs 30Min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>03</b>	<b>04</b>	-	<b>07</b>	-	-	-	-	<b>50</b>	<b>50</b>	<b>100</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

**Note:** For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

### Rationale:

The main objective of this course is to impart knowledge of electronics various components used in electronics industries. This course gives proper knowledge about electronic components from point of view of their operation, testing, characteristics and specifications. Hence the students are able to select different types of electronic components according to their application.

This course is designed for developing fundamentals and motor skills in the electronics field such as testing and handling of tools, components, equipment's, cables, connectors, soldering and de-soldering technique, PCB making etc. Also this course is helpful for students to develop basic skills of assembling, testing, and troubleshooting of PCB in their electronic projects.

**Course Outcomes:** Student should be able to

CO1	Identify and test the different components (Resistors, capacitors, Inductors etc)
CO2	Differentiate between faulty and working components.
CO3	Identify and handling tools, testing equipments.
CO4	Selection of appropriate component, tool, testing equipment according to application.
CO5	Making and testing the PCB.

### Course Content Details:

Unit No	Topics / Sub-topics
<b>1</b>	<p><b>Resistors</b></p> <p>1.1 <b>Classification</b> of component on the basis of energy band theory: (a) Insulator (b) Conductor (c) Semiconductor.</p> <p>1.2 <b>Properties</b> of (a) High resistive materials: Rubber, Sulfur. Carbon, Carbonalloy, metal, metal alloy. (b) High conductive materials: Copper, Gold.</p> <p><b>1.3 Introduction of Components:</b> Discrete and non-discrete (b) Active and Passive (c) Parasitic components. (Definition)</p> <p>1.4 <b>Concept of resistor:</b> Definition, material used, color code method using three four and five bands. (Simple numerical)</p>

	<p><b>1.5 Classification of resistor:</b></p> <p><b>[A] Fixed resistor:</b> Linear Resistor: (a) Carbon film resistor (b) Metal film resistor (c) Wire-wound resistor (d) Carbon composition resistor. (construction, application) Nonlinear resistor: (a) Thermistor (b) Varistor (c) LDR. (working principle, construction, application)</p> <p><b>[B] Variable resistor:</b> (a) Wire wound potentiometer (b) Preset (c) Trimmer / Padder. (construction, application)</p> <p><b>1.6 General specification:</b> Maximum voltage rating, power rating, temperature coefficient, tolerance, ohmic range, operating temperature.</p> <p><b>1.7 Definition, advantages and disadvantages of SMD resistor.</b></p> <p><b>Course Outcome: CO1, CO4 Teaching Hours : 09 Marks: R- NA, U-NA, A-NA</b></p>
2	<p><b>Capacitors</b></p> <p><b>2.1 Introduction:</b> Definition, symbol, dielectric materials used in capacitor.</p> <p><b>2.2 Capacitors specification and definition:</b> Working voltage, Insulation resistance, c/v ratio, Power Factor, Capacitance reactance, frequency characteristics, E.S.R.</p> <p><b>2.3 Properties of Dielectric Material:</b> (a) Paper (b) Ceramic (c) Glass (d) Plastic (e) Mica.</p> <p><b>2.4 Classification of capacitor:</b></p> <p>(A) <b>Fixed capacitors:</b> Electrolytic capacitor: (a) Aluminum (b) Wet type tantalum. Non-electrolytic capacitor: (a) Impregnated paper capacitor (b) Ceramic capacitor (c) Glass capacitor (d) Plastic film capacitor</p> <p>(B) <b>Variable capacitor:</b> (a) Air-gang capacitor (b) PVC gang capacitor (c) Ceramic Trimmer / Padder. (construction, working, application)</p> <p><b>2.5 Coding of capacitors:</b> Using numerals, Color band system.</p> <p><b>Course Outcome: CO1, CO4 Teaching Hours : 07 Marks: R- NA, U-NA, A-NA</b></p>
3	<p><b>Inductors</b></p> <p><b>3.1 Inductors:</b> Definition, concept of self and mutual inductance, co-efficient of coupling, inductive reactance and Q factor.</p> <p><b>3.2 Classification of Inductor:</b></p> <p><b>[A] Fixed inductor:</b> (a) Air core inductor (b) Iron core inductor (c) Ferrite core inductor. (Symbol and application)</p> <p><b>[B] Variable inductors:</b> (a) Slug tuned (b) Tapped inductor. (Construction, working and application)</p> <p><b>Course Outcome: CO1, CO4 Teaching Hours : 05 Marks: R- NA, U-NA, A-NA</b></p>
4	<p><b>Switches and Relays</b></p> <p><b>4.1 Switches:</b> General specifications: voltage rating, contact current rating, contact resistance, operating time, release time, electrical life, mechanical life.</p> <p><b>4.2 Types of switches:</b> (a) Rotary (b) Push to ON (c) Push to OFF (d) Keyboard (e) Slide (f) Toggle switch. (construction and application)</p> <p><b>4.3 Relays:</b> Definition, NO/NC contacts.</p> <p><b>4.4 Types of relays:</b> (a) General purpose relay (b) Dry reed relay (c) Mercury wetted reed relay. (construction, working principle and applications)</p> <p><b>4.5 Comparison</b> between switches and relays.</p> <p><b>Course Outcome: CO1, CO3, CO4 Teaching Hours : 08 Marks: R- NA, U-NA, A-NA</b></p>
5	<p><b>Cables and Connectors</b></p> <p><b>5.1 Cables:</b> Concept of characteristics impedance, current carrying capacity.</p> <p><b>5.2 Types of cables:</b> (a) Coaxial cable (b) Twisted pair cable (c) Twin core (d) Optical</p>

	<p>fiber cable (e) Communication cable. (Construction, specifications and applications)</p> <p>53 <b>Connectors:</b> General specifications: contact resistance, breakdown voltage and insulation resistance.</p> <p>54 <b>Types of connectors:</b> (a) BNC (b) TNC (c) D type (d) Audio (e) Video (f) RJ 45. (construction, specifications and applications.)</p> <p><b>Course Outcome: CO1, CO3, CO4 Teaching Hours : 08 Marks: R- NA, U-NA, A-NA</b></p>
<b>6</b>	<p><b>Printed Circuit Board</b></p> <p>6.1 <b>Introduction to PCB</b>, Advantages &amp; disadvantages of PCB, Types of PCB</p> <p>6.2 Base &amp; Conducting material, types of laminates, Flowchart for preparation of PCB.</p> <p>6.3 Screen printing, photo printing method</p> <p>6.4 Drilling, Mounting of components</p> <p>6.5 <b>Soldering technique:</b> Methods of soldering, Dip, wave, Hand, Necessary conditions for soldering</p> <p>6.6 Final protection, Safety, health &amp; Medical aspects of Soldering</p> <p><b>Course Outcome: CO5 Teaching Hours : 08 Marks: R- NA, U-NA, A-NA</b></p>

**List of experiments: Any 12 experiments out of 15 ( 1 to 8 experiments are compulsory )**

Sr. No.	Unit No	CO	List of Experiments	Hours
1.	1	CO1 CO2	<ul style="list-style-type: none"> <li>To identify and test the resistor (fixed, variable).</li> <li>Find out resistance and tolerance by color code method and multimeter.</li> </ul>	04
2.	2	CO1 CO2	<ul style="list-style-type: none"> <li>To identify and test the capacitor (Electrolytic, Ceramic, Paper, Mica etc)</li> <li>Value by colour code, numerical, character or printed value method.</li> </ul>	04
3.	-	CO3	Identify and handle the controls of analog and digital multimeter.	04
4.	-	CO3 CO4	Function Generator and CRO Handling: To identify the Square wave, Triangular wave and Sine wave generated by Function Generator and measure their Amplitude and Frequency on CRO.	04
5.	5	CO1 CO2 CO4	<ul style="list-style-type: none"> <li>To demonstrate and check the functioning of connectors (BNC, TNC, RJ 45).</li> <li>Connection of any one of the above connectors with appropriate cable.</li> </ul>	04
6.	6	CO5	Introduction of Circuits Drawing Software: <ul style="list-style-type: none"> <li>Identify the features of Electronic Circuit drawing software like Express SCH, EAGLE PCB.</li> <li>Draw circuit diagram of simple circuits.</li> </ul> (Ex. Dual regulated power supply and single stage BJT amplifier etc)	04

7.	6	CO3 CO5	<p>Making of PCB:</p> <ul style="list-style-type: none"> <li>To identify, testing and handling of PCB, Types of PCB.</li> <li>Draw layout on PCB base, use of paint/Templates/Pen etc for tracks.</li> <li>Etching materials, Drill bits used for Drilling.( Fabricate the PCB by pattern transfer, etching, cleaning and drilling)</li> <li>Mounting and Soldering of components on Drilled PCB as per circuit diagram.</li> <li>Cleaning of PCB.</li> <li>Testing and troubleshooting of mounted circuits on PCB. Verifying circuit output.</li> </ul>	10
8.	6	CO1 CO4 CO5	<p><b>Mini Project:</b></p> <p>To prepare PCB (with layout, artwork designed by the student) for small electronic circuits.  <u>Note:</u> Mini project group may consist of 3-4 students. Student has to demonstrate the project and submit the project report in synopsis form.</p>	10
9.	3	CO1 CO2	<ul style="list-style-type: none"> <li>To identify and test the inductors.</li> <li>Find the value and tolerance of inductor by color code method</li> </ul>	04
10.	1	CO1 CO2	<ul style="list-style-type: none"> <li>To identify and test the performance of LDR.</li> <li>Calculate the value resistance for different intensity of light.</li> </ul>	04
11.	4	CO1 CO2	<ul style="list-style-type: none"> <li>To identify and test the various switches (Rotary, Push to ON, Push to OFF, Toggle switch).</li> <li>Determine the value of contact resistance of switches.</li> </ul>	04
12.	4	CO1 CO2	<ul style="list-style-type: none"> <li>To trace the parts of relay coil and NO/NC contacts.</li> <li>Determine the contact resistance of general purpose relay</li> </ul>	04
13.	5	CO1 CO2	To demonstrate and check continuity of cables using meter (Twisted pair, Coaxial, Flat ribbon).	04
14.	6	CO3	<ul style="list-style-type: none"> <li>Demonstration of electronics tool used in lab.</li> <li>Handling and Identification of tools.</li> <li>Applications of electronics tool.(Nose pliers ,wire stripper, screwdrivers, align keys, align screw, cutter, hand Hacksaw &amp; crimping tools (for RJ-45, RJ-11)) .</li> </ul>	04
15.	6	CO1 CO4	<p>Tracing internal parts of the power supply:</p> <p>Opening the power supply &amp; identify the transformer, rectifier section, heat sink, power transistor, earth terminal, fuse.</p>	04
<b>Total</b>				<b>60</b>

**References/ Books:**

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electronic material and component.	Mrs. Madhuri Joshi , Shroff Publication	8173669007/ 9788173669002
2	Electrical and electronic measurements and instruments.	A. K. Sawhney , Dhanpat Rai and Son's	8177000160/ 978-8177000160
3	Electronic components and materials.	S. M. Dhir, Tata McGraw Hill, Education	0-07-463082-2/ 9780074630822
4	Build your own electronic workshop	Thomos Petruzellis, Tata McGraw Hill, Education	0071447245/ 9780071447249
5	Printed Circuit Board	Walter Bosshart, Tata McGraw Hill, Education	0074515497/ 978-0074515495
6	Electronic material and component.	Patil, Deshmukh, Markande ,BPB Publication	---

**E-References:**

1. [www.electronics-tutorials.com](http://www.electronics-tutorials.com)
2. [www.electronicandyou.com](http://www.electronicandyou.com)
3. [www.youtube.com/c/circuitbasics.com](http://www.youtube.com/c/circuitbasics)
4. [www.circuitstoday.com](http://www.circuitstoday.com)
5. <https://techdocs.altium.com/display/ADOH/Tutorial+-Getting+Started+with+PCB+Design> assessed on 8<sup>th</sup> October 2016.
6. [www.zapmeta.co.in/Mini+Project+Of+Electronic](http://www.zapmeta.co.in/Mini+Project+Of+Electronic), assessed on 28th September 2016
7. <https://ndl.iitkgp.ac.in>

**CO Vs PO and CO Vs PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	3	2	-	-	-	-	2	-
CO2	3	2	2	-	-	-	-	2	3	-
CO3	1	2	-	3	-	-	-	2	2	-
CO4	2	2	2	3	-	-	-	3	2	2
CO5	-	-	2	-	2	1	3	3	3	2

**Industry Consultation Committee:**

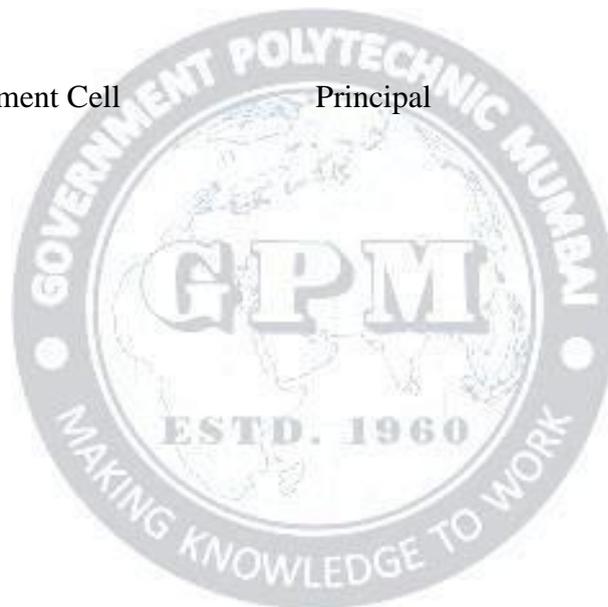
Sr. No	Name	Designation	Institute/Organisation
1	Mr. D.M.Lamture	Head of electronics department.	Government Polytechnic, Kolhapur
2	Mr. Nagesh Pai	Proprietor	Sun Electronics, Borivali West, Mumbai.
3	Mrs. B. J. Nimbalkar.	Sel.Gr Lecturer in Electronics	Government Polytechnic, Mumbai

Coordinator,  
Curriculum Development,  
Department of Electronics

Head of Department  
Department of Electronics

I/C, Curriculum Development Cell

Principal



Programme : <b>Diploma in CE/ME/IT/CO/EC/IS/EE(Sandwich Pattern)</b>										
Course Code: <b>SC19109</b>				Course Title: <b>BASIC MATHEMATICS</b>						
Compulsory / Optional: <b>Compulsory</b>										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs. 30 Min.)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>04</b>	-	-	<b>04</b>	<b>60</b>	<b>20</b>	<b>20</b>	-	-	-	<b>100</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

#### Rationale:

This subject is kept under the branch of sciences. This subject intends to teach student basic facts ,concepts, principles, and procedure of mathematics as a tool to analyze engineering problems and as such lays down foundation for understanding the engineering and core technology subject.

**Course Outcomes:** Student should be able to

<b>CO1</b>	Identify the basic principles of mathematics about the field analysis of any engineering problem.
<b>CO2</b>	Apply rules ,concept and properties to solve the basic problems.
<b>CO3</b>	Establish relation between two variables.

## Course Content Details:

Unit No	Topics / Sub-topics
1	<p><b>1.Trigonometry:</b></p> <p>1.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), Sub multiple angles</p> <p>1.2 Factorization and De-factorization Formulae</p> <p>1.3 Inverse Circular function (definition and simple problems).</p> <p><b>Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2)</b></p>
2	<p><b>2.Vectors:</b></p> <p>2.1 Definition of vector , position vector</p> <p>2.2 Algebra of vectors(Equality, addition ,subtraction and scalar multiplication)</p> <p>2.3 Dot (Scalar) product &amp; Vector (Cross) product with properties.</p> <p><b>Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U-4 , A-4 )</b></p>
3	<p><b>3.Logarithms:</b></p> <p>3.1 Definition of logarithm</p> <p>3.2 Laws of logarithm</p> <p>3.3 simple examples based on laws.</p> <p><b>Course Outcome: CO2 Teaching Hours : 10hrs Marks:10 (R-4 , U- 4 , A-2 )</b></p>
4	<p><b>4.Probability :</b></p> <p>4.1 Definition of random experiment , sample space, event, occurrence of event and types of event ( Impossible , mutually exclusive , exhaustive ,equally likely )</p> <p>4.2 Definition of Probability</p> <p>4.3 Addition &amp; Multiplication Theorems of probability without proof , simple examples</p> <p><b>Course Outcome: CO1 Teaching Hours :10hrs Marks:10 (R-4, U- 4 , A-2 )</b></p>
5	<p><b>5.Determinants:-</b></p> <p>5.1 Definition of Determinant</p> <p>5.2 Expansion of Determinant of order 2X3</p> <p>5.3 Cramer's rule to solve simultaneous equations in 3 unknowns</p> <p><b>Course Outcome: CO2 Teaching Hours :10 hrs Marks:10 (R- 2 , U-4 , A-4 )</b></p>
6	<p><b>6.Matrices:</b></p> <p>6.1 Definition of a matrix of order m x n</p> <p>6.2 Types of matrices</p> <p>6.3 Algebra of matrices - equality, addition,subtraction ,multiplication &amp; scalar multiplication.</p> <p>6.4 Transpose of matrix.</p> <p>6.5 Minor , co-factor of an element.</p> <p>6.6 Adjoint &amp; inverse of a matrix by adjoint method.</p> <p>6.7 Solution of a simultaneous equations by matrix inversion method.</p> <p><b>Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U- 4 , A- 4 )</b></p>

**Suggested Specifications Table (Theory):**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	<b>Trigonometry</b>	04	04	02	10
2	<b>Vectors</b>	02	04	04	10
3	<b>Logarithms</b>	04	04	02	10
4	<b>Probability</b>	04	04	02	10
5	<b>Determinants</b>	02	04	04	10
6	<b>Matrices</b>	02	04	04	10
<b>Total</b>		<b>18</b>	<b>24</b>	<b>18</b>	<b>60</b>

**References/ Books:**

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Mathematics for Polytechnic Students	S.P.Deshpande, Pune Vidyavardhini Graha Prakashan	-
2	Mathematics for Polytechnic Students ( Volume I )	H.K.Dass, S.Chand Prakashan	9788121935241
3	Companions to Basic Maths	G.V.Kumbhojkar, Phadke Prakashan	10-B07951HJDQ 13-B07951HJDQ
4	Applied Mathematics	N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh	9789339219567, 9339219562

**E-References:**

1. [www.math-magic.com](http://www.math-magic.com)
2. [www.Scilab.org/-SCI](http://www.Scilab.org/-SCI) Lab
3. [www.mathworks.com/Products/Matlab/-MATLAB](http://www.mathworks.com/Products/Matlab/-MATLAB)
4. [www.wolfram.com/mathematica/-Mathematica](http://www.wolfram.com/mathematica/-Mathematica)
5. <https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig>
6. [www.dplot.com/-Dplot](http://www.dplot.com/-Dplot)
7. [www.allmathcad.com/-Math CAD](http://www.allmathcad.com/-Math CAD)
8. [www.easycalculation.com](http://www.easycalculation.com)
9. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths>
10. MYCBSEGUIDE

**CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		1
CO2	3	2					1	1		1
CO3	3			2			1	1		1

**CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			2			1	1	
CO2	3	2					1	1	
CO3	3			2			1	1	

**CO Vs PO and CO Vs PSO Mapping (COMPUTER ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		
CO2	3	2					1	1		
CO3	3			2			1	1		

**CO Vs PO and CO Vs PSO Mapping (INFORMATION TECHNOLOGY)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	1		1
CO2	3	2					1	1		1
CO3	3			2			1	1		1

**CO Vs PO and CO Vs PSO Mapping (ELECTRONICS ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1		1	1
CO2	3	2					1		1	1
CO3	3			2			1		1	1

**CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1		1	
CO2	3	2					1		1	
CO3	3			2			1		1	

**CO Vs PO and CO Vs PSO Mapping ( INSTRUMENTATION ENGINEERING)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			2			1	1	1
CO2	3	2					1	1	1
CO3	3			2			1	1	1

**Industry Consultation Committee:**

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3	Mr. A.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai
4	Mr. V.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai

Head of Department

Coordinator,  
Curriculum Development,  
Department of Science And Humanities

Department of Science And Humanities

I/C, Curriculum Development Cell

Principal

Programme : <b>Diploma in Electronics Engineering (Sandwich Pattern)</b>										
Course Code: SC19104				Course Title: <b>Physics</b>						
Compulsory / Optional: <b>Compulsory</b>										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2Hrs.30 minutes)	TS1 (1Hr.)	TS2 (1 Hr.)	PR	OR	TW	Total
<b>3</b>	<b>2</b>	<b>--</b>	<b>5</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>25*</b>	<b>--</b>	<b>25</b>	<b>150</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

### Rationale:

The subject is included under the category of science. The special feature of the subject is to develop the laboratory skill using principles of scientific phenomenon. This course will serve to satisfy the need of the technical students for their development in technical field. The course is designed by selecting the topics which will develop intellectual skills of the students and will guide students to solve broad based engineering problems. Ultimately the focus of the course is to develop psychomotor skills in the Students.

**Course Outcomes:** Student should be able to

CO1	State the different physical quantities, identify the proper unit of it and to estimate error in the measurement of physical quantities
CO2	Apply laws of motion in various engineering applications
CO3	Apply the concept of electric field in Engineering field.
CO4	Apply the concept of Sound waves , Nanotechnology, Ultrasonic waves in engineering applications
CO5	Identify the physical properties of the various materials such as, elasticity and viscosity

**Course Content Details:**

<b>Unit No</b>	<b>Topics / Sub-topics</b>
1	<p><b>Units and Measurements</b></p> <p>1.1 Fundamental Physical quantities, examples.            1.2 Derived physical quantities, examples.            1.3 Definition and requirements of unit            1.4 System of units, C. G. S., M. K. S. and S. I. units.            1.5 Rules to write the unit and conventions of units and Significant figures, rules to write significant figures.            1.6 Error – Definition, types of errors and estimation of errors.            1.7 Numerical</p> <p><b>Course Outcome: CO1 Teaching Hours: 6 hrs. Marks: 8 (R- 2, U-2, A-4)</b></p>
2	<p><b>Motions</b></p> <p>2.1 <b>Linear motion</b> –Definition – distance, displacement, velocity, acceleration retardation, equations of motion, Numerical.            2.2 <b>Periodic motions</b> : a)Oscillatory motion, b)Vibratory motion, c) S.H.M.), d) Circular motion. (only definition and examples) some terms related to S.H.M.-- Definition: Time period, frequency, Amplitude, wavelength, phase            2.3 <b>Angular motion:</b> a)Uniform circular motion, Radius vector, linear velocity, Angular velocity , Angular acceleration,            b) Relation between linear velocity and angular Velocity (derivation), Radial or centripetal acceleration, Three equations of motion (no derivations) Centripetal and Centrifugal force, examples and Applications.</p> <p><b>Course Outcome: CO2 Teaching Hours: 8 hrs. Marks: 10 (R- 2 , U-4 , A-4 )</b></p>
3	<p><b>Electrostatics</b></p> <p>3.1 Definition of charge            3.2 Coulombs law Definition of electric field Definition and unit of electric field intensity (E)            3.3 Definition and properties of electric lines of force            3.4 Definition of electric flux and electric flux density            3.5 Electric Potential            3.6 Definition &amp; Explanation of Electric Potential            3.7 Definition &amp; Explanation of absolute Electric Potential            3.8 Equation of electric potential (no derivation)            3.9 Numerical.</p> <p><b>Course Outcome: CO3 Teaching Hours: 6 hrs. Marks: 8 (R- 2 , U- 4 , A- 2)</b></p>
4	<p><b>Sound Waves</b></p> <p>4.1 Wave motion, types of waves – progressive Waves: Longitudinal and transverse waves.            4.2 Characteristics of longitudinal and transverse waves And comparison between longitudinal and transverse waves.            4.3 Free or natural vibrations and forced vibrations, Resonance – definition and examples.            4.4 Determination of velocity of sound by resonance Method.            4.5 Numerical.</p> <p><b>Course Outcome: CO4 Teaching Hours: 6 hrs. Marks: 8 (R- 2 , U- 4 , A- 2)</b></p>

5	<p><b>Nanotechnology &amp; Ultrasonic Waves</b></p> <p><b>5.1 Nanotechnology :</b></p> <p>5.1.1 Introduction to nanotechnology.</p> <p>5.1.2 Definition of Nano scale, manometer and nanoparticles, Nanotechnology.</p> <p>5.1.3 Definition and examples of nanostructured materials.</p> <p>5.1.4 Applications of nanotechnology in different fields -</p> <p>a) electronics, b) automobile, c) medical, d) textile, e) Cosmetics, f) environmental, g) space and defense.</p> <p><b>5.2 Ultrasonic Waves</b></p> <p>5.2.1 Ultrasonic waves and infrasonic waves.</p> <p>5.2.2 Audible range of sound wave</p> <p>5.2.3 Properties of ultrasonic wave.</p> <p>5.2.4 Applications.</p> <p><b>Course Outcome: CO5 Teaching Hours: 8 hrs. Marks: 10 (R- 2 , U- 2 , A-6 )</b></p>
6	<p><b>General Properties of Matter:</b></p> <p>6.1 Elasticity:</p> <p>6.1.1 Deforming force, restoring force, Elastic, plastic and Rigid substances, and their examples.</p> <p>6.1.2 Definition of elasticity, stress, strain and its types.</p> <p>6.1.3 Hooke's Law and elastic limit.</p> <p>6.1.4 Stress - Strain curve yield point, breaking point.</p> <p>6.1.5 Young's Modulus, bulk modulus and modulus of Rigidity – Definition and relation among them.</p> <p>6.1.6 Factor of safety.</p> <p>6.1.7 Applications of elasticity.</p> <p>6.1.8 Numerical</p> <p><b>6.2 Viscosity</b></p> <p>6.2.1 Concept and Definition of viscosity, velocity gradient.</p> <p>6.2.2 Newton's law of viscosity, Co-efficient of viscosity, unit of viscosity</p> <p>6.2.3 Stokes law, terminal velocity, derivation of Stoke's Formula.</p> <p>6.2.4 Streamline flow, turbulent flow, critical velocity.</p> <p>6.2.5 Reynolds's number and its significance.</p> <p>6.2.6 Applications of viscosity</p> <p>6.2.7 Numerical</p> <p><b>Course Outcome: CO5 Teaching Hours: 11 hrs. Marks: 16 (R- 4 , U- 6 , A-6 )</b></p>

**Suggested Specifications Table (Theory):**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Units and Measurements	2	2	4	8
2	Motion	2	4	4	10
3	Electrostatics	2	4	2	8
4	Sound waves	2	4	2	8
5	Nanotechnology & Ultrasonic waves	2	2	6	10
6	General Properties of Matter	4	4	8	16
<b>Total</b>		<b>14</b>	<b>20</b>	<b>26</b>	<b>60</b>

**List of experiments:**

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO 1	To know your Physics laboratory and use of scientific calculator	2
2	1	CO 1	To measure the dimensions of given objects and to determine their Volume using Vernier caliper.	2
3	2	CO 2	To determine Acceleration due to gravity by simple pendulum.	2
4	3	CO3	To verify principle of potentiometer.	2
5	4	CO 4	To determine velocity of sound by resonance method.	2
6	6	CO 5	To determine the Young's modulus of elasticity of wire using Young's apparatus.	2
7	1	CO1	To measure the dimensions of given objects and to determine their volume using micrometer screw gauge.	2
8	6	CO 5	To determine coefficient of viscosity of liquid by Stokes' method .	2
9	4	CO4	To determine sound absorption coefficient of different materials.	2
10	2	CO 2	To determine stiffness constant by using helical spring .	2
11	4	CO4	To determine velocity of sound by using sonometer.	2
12	5	CO4	To study applications of nanotechnology in engineering field.	2
13	3	CO 3	To verify coulomb's law of electrostatics.	2
14	6	CO 5	To determine coefficient of viscosity of given liquid by using poiseuille's method.	2
15	ALL	CO 1	Showing Video on different applications related to units	2
<b>Total</b>				<b>30</b>

**Note: Experiments No. 1 to10 are compulsory and should map all units and Cos.  
Remaining 5 experiments are to be performing on the importance of topic.**

**References/ Books:**

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Applied Physics	Manikpure&Deshpande ,S.Chand& Company	10:8121919541 13:9788121919548
2	Applied Physics	B.G.Bhandarkar, Vrinda Publication	0071779795
3	Optics & Optical Fibers	Brijlal Subhramanyan	978-3-662-52764-1
4	Engineering Physics	Gaur and S.L.Gupta S.Chand& Company	0-07-058502
5	Physics	Resnick and Halliday Tata McGraw Hills	978-0-07-1755487-3
6	Physics part I & II	H.C.Varma	9788177091878
7	Properties of Matter	D.S.Mathur	13: 978-8121908153

**E-References:**

1. [www.physics.org](http://www.physics.org)
2. [www.physicsclassroom.com](http://www.physicsclassroom.com)
3. [www.youtube.com/physics](http://www.youtube.com/physics)
4. [www.ferrophysics.com](http://www.ferrophysics.com)
5. <http://hperphysics.phastr.gsu.edu/hbase/hph.htm>
6. [www.sciencejoywagon.com/physicszone](http://www.sciencejoywagon.com/physicszone)
7. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-physics>
8. MYCBSEGUIDE
9. <https://ndl.iitkgp.ac.in/>

**CO Vs PO and CO Vs PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			2			1	2	1	1
CO2	3							1		1
CO3	3				1			1	1	1
CO4	3			2	1			2	1	1
CO5	3		2				1	1	1	2

**Industry Consultation Committee:**

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2	Mrs Raji Nair	Lecturer in Physics	VPM Polytechnic
3	Mrs S.A. Thorat	Lecturer in Physics	Govt. Polytechnic Mumbai
4	Dr. D.S. Nikam	Lecturer in Physics	Govt. Polytechnic Mumbai

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I/C, Curriculum Development Cell

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Programme : <b>Diploma in Electronics Engineering (Sandwich Pattern)</b>										
Course Code: <b>EE19210</b>				Course Title: <b>Fundamentals of Electrical Engineering</b>						
Compulsory / Optional: <b>Compulsory</b>										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 min)	TS1 (1Hr)	TS2 (1Hr)	PR	OR	TW	Total
<b>4</b>	<b>2</b>	<b>-</b>	<b>6</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>-</b>	<b>50</b>	<b>50</b>	<b>200</b>

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , \* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

**Note:** For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

**Rationale:**

All the equipment related to electronics utilizes electrical energy for their operations. Diploma holders from this branch come across various types of electrical circuits. The purpose of this subject is to give fundamental knowledge of electrical engineering so that they will be able to handle electrical equipment's, electrical & electronic circuits and analyze simple DC/AC circuits.

**Course Outcomes:** Student should be able to

<b>EE19210.1</b>	Define basic terminologies related to electrical circuit
<b>EE19210.2</b>	Solve simple DC circuits
<b>EE19210.3</b>	Realise Magnetism and Electromagnetism concept
<b>EE19210.4</b>	State concepts of ac fundamentals and solve simple ac series circuits.
<b>EE19210.5</b>	Primitive performance of single-phase transformer
<b>EE19210.6</b>	Use of electrical safety to avoid electrical hazards.

**Course Content Details:**

Unit No	Topics / Sub-topics
<b>1</b>	<p><b>Basic Concepts:</b></p> <p>1.1 Electric Current: Definition, Direction of current, unit, Electric potential, Potential difference, Concept of EMF and Potential difference.</p> <p>1.2 Resistance: Definition, unit, Factors on which resistance depends Effect of temperature on resistance. (<i>simple numerical</i>)</p> <p>1.3 Conductance, Ohms Law. (<i>simple numerical</i>)</p> <p>1.4 Electric power and energy concept and unit. (<i>simple numerical</i>)</p> <p>1.5 Measurement of voltage, current, power and energy.</p> <p>1.6 Effects of Electric Current: Heating Effect, Magnetic Effect and Chemical Effect.(<i>Only</i>)</p>

	<p><i>Introduction)</i></p> <p><b>Course Outcome: EE19210.1 Teaching Hours :10 hrs Marks: 10 (R-0 , U-2, A-8)</b></p>
2	<p><b>DC Circuits:</b></p> <p>2.1 Introduction to concept.</p> <p>2.2 DC series circuit: Concept, Equation for equivalent resistance connected in series, Main Characteristics, Advantages, Disadvantage, Application of series circuit.</p> <p>2.3 DC Parallel circuit: Concept, Equation for equivalent resistance connected in parallel, Main Characteristics, Advantages, Application of Parallel circuit, Current divider rule.</p> <p>2.4 Series parallel circuit, Application of series parallel circuit.</p> <p>2.5 Definition of: Circuit, Parameter, Linear circuit, Nonlinear circuit, Bilateral circuit, Unilateral circuit, Electric network, Passive-Network, Active network, Node, Branch, Loop, Mesh.</p> <p>2.6 Kirchhoff's current law, Kirchhoff's voltage law, signs convention. (simple numerical limited up to two variables on above)</p> <p><b>Course Outcome: EE19210.2 Teaching Hours :12 Marks: 10 (R- 2 , U- 0 , A- 8 )</b></p>
3	<p><b>Magnetism and Electromagnetic induction:</b></p> <p>3.1 Definition of Magnetic field, Magnetic flux, Magnetic flux Density, Magnetic Intensity, Absolute and Relative permeability, relation between B and H.</p> <p>3.2 Magnetic effect of electric current, Right hand rule, cork screw rule, Current carrying conductor in magnetic field, Fleming's left-hand rule.</p> <p>3.3 Magnetic circuit, mmf, Reluctance, Permeance, comparison between Magnetic and Electric circuit.</p> <p>3.4 Magnetization curve for magnetic and non-magnetic material, Magnetic Hysteresis, Hysteresis Loop, Hysteresis Loops for Hard &amp; Soft Magnetic Materials, residual flux, Retentivity, coercive force, Hysteresis loss.</p> <p>3.5 Electromagnetic induction, Faradays laws of electromagnetic Induction, Lenz's law, Flemings right hand rule, Dynamically induced EMF, Statically induced EMF, self-Inductance, mutual inductance, coefficient of coupling. (Only equations, No derivation of equations and numerical on unit 3)</p> <p><b>Course Outcome: EE19210.3 Teaching Hours :10 Marks: 10 (R- 4 , U- 6 , A- 0 )</b></p>
4	<p><b>AC Fundamentals:</b></p> <p>4.1 Difference between AC and DC quantity.</p> <p>4.2 Advantages of AC Over DC.</p> <p>4.3 Generation of A.C. Voltage and current.</p> <p>4.4 Mathematical Expression of alternating quantity &amp; its derivation.</p> <p>4.5 Definition of Waveform, Instantaneous value, Cycle, Time period, Frequency, Amplitude, Peak value, Average value and RMS value, Form factor and Peak factor for sinusoidal (no derivation, simple numerical on it)</p> <p>4.6 Phase, Phase difference, Phasor representation of sinusoidal quantities</p> <p>4.7 Circuit diagram, phasor diagram and wave form of a.c. circuits through pure Resistance, Pure Inductance and pure Capacitance. Concept of inductive reactance and capacitive reactance.</p> <p>4.8 Circuit diagram, phasor diagram and wave form of a.c. circuits RL, RC and RLC circuit. Impedance and Impedance Triangle. (simple numerical)</p> <p>4.9 Power- active, reactive and apparent, power triangle.</p>

	4.10 Power factor and its significance.  <b>Course Outcome: EE19210.4 Teaching Hours : 15 Marks: 12 (R- 0 , U- 4 , A- 8)</b>
5	<b>Single Phase Transformer:</b> 5.1 Construction and working of transformer, classification, brief description of each part, its function 5.2 significance of E.M.F. equation ( <i>No derivation</i> ) 5.3 Voltage ratio, current ratio and transformation ratio. 5.4 KVA rating of a transformer. 5.5 Losses in a transformer 5.6 Efficiency and voltage regulation (no numerical) 5.7 Auto transformer-comparison with two winding transformers and application  <b>Course Outcome: EE19210.5 Teaching Hours :6 Marks:10 (R-2 , U- 8 , A- 0)</b>
6	<b>Electrical Safety</b> 6.1 Fuse: Operation, types 6.2 Switch Fuse Unit and Fuse Switch Unit: Differences 6.3 MCB, ELCB & MCCB: Operation and general specification. 6.4 Earthing: Definition, necessity of earthing, types of earthing. 6.5 Electrical Safety precautions in electrical indoor and outdoor installations. 6.6 First Aid Treatment: Precautions if person gets an electric shock. Methods of artificial respiration  <b>Course Outcome: EE19210.6 Teaching Hours :7 Marks:8 (R-4 , U-4 , A-0 )</b>

**Suggested Specifications Table (Theory):**

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basic Concepts	--	2	8	10
2	DC Circuits	2	--	8	10
3	Magnetism and Electromagnetic induction	4	6	--	10
4	AC Fundamentals	--	4	8	12
5	Single phase Transformer	2	8	--	10
6	Electrical Safety	4	4	--	8
<b>Total</b>		<b>12</b>	<b>24</b>	<b>24</b>	<b>60</b>

**List of experiments: Any 10 experiments out of 15**

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	<b>EE192 10.1</b>	To measure current, voltage, power and energy in single-phase circuit	02
2	2	<b>EE192 10.2</b>	Measure voltages and currents in series resistive circuit.	02
3	3	<b>EE192 10.3</b>	To plot the B-H curve for magnetic material and determine the relative Permeability	02
4	4	<b>EE192 10.4</b>	Observe AC & DC waveform and measure AC voltage & DC voltage with oscilloscope.	02
5	5	<b>EE192 10.5</b>	To verify efficiency and regulation of transformer	02
6	6	<b>EE192 10.6</b>	Safety precautions to be observed for indoor and outdoor installations and know first aid practice also refer artificial respiration chart	02
7	1	<b>EE192 10.1</b>	To verify the effect of temperature on resistance of copper conductor.	02
8	2	<b>EE192 10.2</b>	Measure voltages and currents in parallel resistive circuit.	02
9	3	<b>EE192 10.3</b>	Observe that EMF is induced in coil when magnetic lines of force move across winding and observe its polarity	02
10	4	<b>EE192 10.4</b>	Determine impedance, phase angle of R-L series circuit, plot phasor diagram and also calculate active, reactive and apparent power consumed in R-L series circuit.	02
11	5	<b>EE192 10.5</b>	Measure the transformation ratio of transformer	02
12	6	<b>EE192 10.6</b>	Measure Earth resistance using earth tester. Observe procedure of plate earthing	02
13	2	<b>EE192 10.2</b>	Verify Kirchhoff's current law	02
14	2	<b>EE192 10.2</b>	Verify Kirchhoff's voltage laws	02
15	4	<b>EE192 10.4</b>	Observe the phase relationship between voltage and current in pure resistive, inductive and capacitive circuit.	02
<b>Total</b>				<b>30</b>

**Note: Experiments No. 1 to 6 are compulsory and should map all units and Cos. Remaining**

4 experiments are to be perform on the importance of topic.

**References/ Books:**

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electrical Technology (Volume I)	B. L. Theraja and A. K. Thereja, S. Chand and Co. Ltd.	81-219-2440-5
2	Basic Electrical Engineering	V. K. Mehta and Rohit Mehta, S. Chand and Co. Ltd.	9788121908719
3	Electrical Technology	Edward Hughes, ELBS Publications.	9780582226968

**E-References:**

1. [www.nptel.com](http://www.nptel.com)
2. [www.electrical4u.com](http://www.electrical4u.com)
3. [www.khanacademy.org](http://www.khanacademy.org)
4. <https://ndl.iitkgp.ac.in/>

**CO Vs PO and CO Vs PSO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE19210.1	3	3	--	2	2	--	3.	2	2	2
EE19210.2	3	3	--	2	2	--	3	2	2	2
EE19210.3	3	3	--	2	--	--	3	3	2	2
EE19210.4	3	--	--	2	2	--	3	3	2	2
EE19210.5	3	3	--	2		--	3	3	2	2
EE19210.6	--	--	--	3	3	--	3	2	2	--

**Industry Consultation Committee:**

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