

Course Name : Diploma in Electrical Engineering

Semester : Third

Subject Title : Mathematics - III

Subject Code : DTMA2101

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme												Total Marks
L	T	P		Theory		Test	Total		Pract		Oral		Termwork			
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min		
3	1	-	3	100	35	25	125	50	-	-	-	-	25	10	150	

Objectives:-

1. To make students well versed in various methods of integration for solving problems.
2. To impart knowledge of Laplace Transform.

SYLLABUS

Ser. No.	Contents	L	M
1	<p>Integration</p> <p>1.1 Definition of integration. Integration of standard functions.</p> <p>1.2 Theorems of integration.</p> <p>1.3 Methods of Integration</p> <p style="padding-left: 20px;">1.3.1 Integration by substitution</p> <p style="padding-left: 20px;">1.3.2 Integration by trigonometric transformation.</p> <p style="padding-left: 20px;">1.3.3 Integration by partial fractions.</p> <p style="padding-left: 20px;">1.3.4 Integration by parts.</p> <p>1.4 Definite Integration</p> <p style="padding-left: 20px;">1.4.1 Definition of definite integral.</p> <p style="padding-left: 20px;">1.4.2 Properties of definite integral with simple problems.</p> <p style="padding-left: 20px;">1.4.3 Reduction formulae.</p>	20	35
	<p>1.5 Applications of definite integrals.</p> <p style="padding-left: 20px;">1.5.1 Area under curve. Area bounded by two curves.</p> <p style="padding-left: 20px;">1.5.2 Mean and RMS value</p>	07	15
2	<p>Laplace Transform</p> <p>2.1 Definition of Laplace Transform, Laplace Transform of Standard functions.</p> <p>2.2 Properties of Laplace Transform - Linearity, first</p>	11	25

	Shifting property, multiplication by t^n , division by t .		
	2.3 Inverse Laplace Transform by definition 2.3.1 Properties of Inverse Laplace Transform 2.3.2 Method of partial fractions. 2.4 Laplace Transform of derivatives. 2.5 Solution of differential equation using Laplace Transform	10	25
	Total	48	100

Learning resources:

Text books:

- 1) Applied Mathematics III- B.M.Patel, J.M.Rawal and others - Nirali Prakashan
(July-2010)
- 2) Mathematics for Polytechnic students- S. P. Deshpande- Pune Vidyarthi Griha
Prakashan (first edition-Aug.2005)

Reference books :

- 1) Applied Mathematics II (Electrical, Instrumentation and Boimedical) –
G.V. Kumbhojkar - C. Jamnadas & Co.(Revised third edition 2010-11)

Course Name : Diploma in Electrical Engineering
Semester : Third
Subject Title : Electrical Networks - I
Subject Code : DTEE2102

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	1	2	3	100	35	25	125	50	-	-	25	10	25	10	175

Objectives:-

- The students should be able to:
- 1) Explain the behaviour of RC charging and discharging circuits and RL circuits.
 - 2) Analyze single & three phase circuits using resistor, inductor & capacitor elements.
 - 3) Explain and analyze series and parallel resonant behaviour of a circuit.
 - 4) Analyze different theorems for dc and ac circuits using dependent sources.
 - 5) Study network topology.

Syllabus

Part I:- Theory

Sr. No	Contents	L	M
1	D.C. Transients: a) RC circuits b) RL Circuits	04	07
2	A.C Fundamentals: a) Alternating Current and Voltage,	12	25

	b) Sinusoidal, Triangular, Square. (Periodic waveforms) c) Frequency, Time Period, Phase Angle of A.C waveforms. d) R.M.S value, average value and Phasor representation of alternating quantities. e) Inductors & capacitors, phase relationships & concept of impedance. f) Introduction to rectangular and polar forms of A.C quantities. g) Polyphase circuits- Star and Delta h) Power Measurements in Polyphase Circuits		
3	Resonance: a) Series Resonance b) Parallel Resonance	05	08
4	Circuit Analysis (For A.C and D.C circuits with dependent sources): a) Mesh Analysis b) Nodal Analysis c) Source Conversion d) Source Shifting	10	20
5	Network Theorems (For A.C and D.C circuits with dependent sources): a) Thevenin's Theorem b) Norton's Theorem c) Superposition Theorem e) Maximum power Transfer	10	20
6	Network Topology. (Graph Theory): a) Graph and Subgraphs b) Tree and Cotree c) Cutset and Tieset d) Solve solution of simple networks.	07	20
	Total	48	100

Tutorials: 10 Problems based on each topic.

Part II:- Practicals:-

List of Laboratory Experiments:-

- Transient response of RL circuit.
- Transient response of RC circuit.
- Phase Shift measurement in RL Circuit.
- Phase Shift measurement in RC Circuit.
- Phase Shift measurement in RLC Circuit
- Power Measurements in A.C circuits-One Watt Meter method.
- Power Measurements in A.C circuits-Two Watt Meter method. Experiment on Series Resonance.
- Experiment on Parallel Resonance.

Learning Resources:-

Textbook:-

Circuits & Networks 4th Edition by Sudhakar & Shyammohan,
(Tata McGraw - Hill Publishing Company Limited).

Reference Books:-

- 1) Engineering Circuit Analysis 6th Edition by William H. Hayt, Jr. & Jack E. Kemmerly, (Tata McGraw - Hill Publishing Company Limited).
- 2) Network Analysis, 3rd Edition by Van Valkenberg, Prentice Hall India Private Limited.
- 3) Network systems, 2nd Edition by D. Roy Chaudhary, New Age International.

Course Name : Diploma in Electrical Engineering
Semester : Third
Subject Title : Electronics - I
Subject Code : DTEE2103

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
4	-	3	3	100	35	25	125	50	-	-	25	10	25	10	175

Objectives:-

The students should be able to:

- 1) Identify different diodes on their characteristics and application basis.
- 2) Prepare different types of rectifier and filter circuits.
- 3) Analyze different configurations of Bipolar Junction Transistor circuits.
- 4) Build small signal amplifier and switch applications of Transistor.
- 5) Identify different types of optoelectronic devices on basis of their construction, characteristics and applications.

Syllabus

Part I:- Theory

Sr. No.	Contents	L	M
1	<p>Semiconductor Diode :</p> <p>a) Diode: Review of P and N type semiconductors, PN junction diode, its equation. Junction and Diffusion capacitance. Characteristics and various specifications (ratings) of a PN junction diode.</p> <p>b) Diode Applications : Diode as a switch.</p> <p>i) Rectifiers & Filters: Half Wave Rectifier (HWR), Full Wave Rectifier (FWR) - centre tap transformer and bridge type. Their comparison on the basis of</p>	20	30
2	<p>circuit operation, waveforms, average(dc) value of rectifier output, ripple factor, ripple frequency, transformer utilization factor, rectification efficiency, advantages and disadvantages</p> <p>Filter types – C, L, LC, CLC (π). Comparison, merits & demerits.</p> <p>ii) Clipping & Clamping circuits : Types and applications.</p> <p>iii) Voltage Multiplier circuits : Types and applications.</p> <p>c) Zener diode : Construction, Characteristics, Various Specifications(Ratings). Application in a simple voltage regulator circuit.</p> <p>d) Point Contact Diode, Varactor Diode and Schottky Diode</p> <p>Bipolar Junction Transistors (BJT) :</p> <p>i) Construction, working principle of PNP and NPN transistors, characteristics of CB, CE and CC configurations. DC and AC current gains α, β, γ.</p>	30	40

	<p>Requirement of biasing, different types of biasing circuits fixed, bias circuit with emitter resistor, collector to base biasing circuit, voltage divider biasing circuit and emitter bias circuit. Thermal stability factor. Comparison of each on the basis of thermal stability. Transistor Specifications. Transistor Testing.</p> <p>ii) a) Application of BJT in a Small Signal Amplifier:</p> <p>r_e transistor model, Hybrid equivalent model.</p> <p>Analysis of CE single stage Small Signal Amplifier (with un-bypassed & bypassed emitter resistor), using approximate hybrid equivalent circuit & r_e model. (amplifier input, output impedance, current & voltage gain).</p> <p>b) Application of BJT CE inverter switch.</p>		
3	<p>Unijunction Transistor (UJT) : Construction, principle of operation, characteristic and use of UJT in Relaxation Oscillator circuit.</p>	04	10
4	<p>Optoelectronic Devices : Construction, working, characteristics and applications of photoconductive cell, photovoltaic cell, Light Emitting Diode, Infra Red Light Emitting Diode, their spectral response curves, Liquid Crystal Display, Opto-Optocouplers.</p>	10	20
	Total	64	100

Part II:- Practicals

List of Laboratory Experiments:-

- 1) Characteristics of Germanium and Silicon Diode.
- 2) Characteristics of Zener Diode

- 3) Characteristics of Light Emitting Diode (Red, Green, Yellow and Blue color).
- 4) Input and Output characteristics of Common Emitter BJT.
- 5) Characteristic of Photodiode and Phototransistor.
- 6) Diode rectifier circuits (HWR and FWR), without and with C – type filter.
- 7) Diode Clipping and Clamping circuits.
- 8) Single stage CE Small Signal Amplifier. (With un- bypassed & bypassed R_E)
- 9) BJT CE switch application.
- 10) UJT characteristics and UJT Relaxation Oscillator circuit.
- 11) Zener Diode voltage regulator.

NOTE: Students must perform at least one experiment of above topics on MULTISIM Electronic Workbench Software and submit with the laboratory journal.

Learning Resources:- Text Book:-

Electronic Devices and Circuit Theory, 9th Edition by Robert Boylestad & Louis Nashelsky, Prentice Hall India Private Limited.

Reference Books:-

- 1) Electronic Principles, 7th Edition by Albert Paul Malvino, (Tata McGraw - Hill Publishing Company Ltd).
- 2) Electronic Devices and Circuits, 5th Edition by David Bell, Oxford University Press.
- 3) Basic Electronics and Linear Circuits, 4th Edition by Bhargava, Kulshrestha and Gupta (Tata McGraw - Hill Publishing Company Limited).

Course Name : Diploma in Electrical Engineering
Semester : Third
Subject Title : Measuring Instruments
Subject Code : DTEE2104

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme										Total Marks	
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max		Min
3	-	2	3	100	35	25	125	50	-	-	25	10	25	10	175

Objectives:

The students should be able to:

- 1) Know the construction of the instruments.
- 2) Understand the principles and operation of different measuring instruments.
- 3) Select the appropriate instrument for measurement.
- 4) Observe reading and interpret the values from different meters.
- 5) Give the applications of the instruments.

Syllabus

Part I:- Theory

Sr. No.	Contents	L	M
1	Error classification, dimensions of electrical quantities, Standard of resistance and voltage.	04	08
2	CRO block diagram, functions of the various blocks, time-base generators. Synchronization of the sweep, triggered sweep, delay line in triggered sweep. Dual trace and dual beam CRO, measurement of phase and frequency using CRO,	07	15

	Lissajous patterns, Storage oscilloscope		
3	Ammeter and voltmeter(DC), multi-range ammeters, multi-range voltmeters. Loading effect of voltmeter and solid state voltmeter, extension of range of voltmeter and ammeter and problems based on the same.	07	15
4	Indicators and Display Devices. Energy meters.	05	10
5	Principal of Wheatstone bridge, limitations of Wheatstone bridge measurement of medium resistance by ammeter, voltmeter method. Kelvin's double bridge for measurement of low resistance, meggar and analog multimeter. D.C. potentiometer and principal of A.C. potentiometer, application of potentiometer.A.C. bridges, Maxwell Inductance bridge, Schering bridge and Wien Bridge.		
6	Digital Instruments: Digital Multimeters, Digital Frequency Meter (basic circuit) Digital Measurement of Time (periodic measurement), Universal Counter.	07	12
7	Recorders: Strip chart recorder, XY recorder.	05	10
8	Phase and frequency meter (digital): Requirement of signal generator and theory of signal generator, Function generator	05	10
	Total	48	100

Part II:- Practicals

List of Laboratory Experiments:-

- 1) Errors in measurements: Resistance, Series and parallel connected resistances.
- 2) Measurement of medium resistance using V-I method.
- 3) Measurement of Inductance using A.C. Bridge
- 4) Measurement of capacitance using A.C. Bridge
- 5) Extension of range of voltmeter and ammeters.
- 6) Extension of range of an ammeter.
- 7) Measurement of high resistance using Meggar
- 8) Measurement of Frequency, Peak-to-peak voltage of different signals using CRO
- 9) Measurement of Phase shift using Lissajous patterns.
- 10) Measurement of Frequency using Intensity modulation.

Learning Resources:-

Text Book :-

Electronic Instrumentation, 2nd Edition by H. S. Kalsi,
(Tata McGraw - Hill Publishing Company Limited).

Reference Book :-

- 1) A Course in Electrical and Electronics Measurements, 18th Edition
by A K Sawhney, Dhanpat Rai & Company Private Limited.
- 2) Modern Electronic Instrumentation and measurement techniques 3rd Edition
By Albert D Helfrick and William D Cooper, Prentice Hall
India Private Limited.

Course Name : Diploma in Electrical Engineering
Semester : Third
Subject Title : Power Plant Engineering
Subject Code : DTEE2105

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	2	-	3	100	35	25	125	50	-	-	25	10	25	10	175

Objectives:-

The students should be able to:

- 1) Explain the working of different power plants.
- 2) Explain various systems of generating stations.
- 3) Select suitable sites for different power stations.
- 4) Define the terms used in economics of power generation and explain their relation.
- 5) Select alternative energy sources for given conditions.
- 6) Explain the working of wind mills and solar systems.

Syllabus

Part I:- Theory

Sr. No.	Contents	L	M
1	Introduction to Power Plant Engineering: <ul style="list-style-type: none">● Importance of electrical power in day today life● Various sources of energy Solid fuels, Liquid fuels, Gaseous fuels (Conventional sources).● Method of electrical power generation, General principle.● Comparison of Sources of power.	6	15
2	Thermal Power Plant: <p>Block diagram and working of Thermal Power Station. Main parts of Thermal plant in brief (Boiler, Economizer, Air pre-heater, Super-heaters & re-heaters. Steam prime movers,</p> <ul style="list-style-type: none">● Condensers. Spray ponds & Cooling towers.) <p>Selection of site for thermal power stations. Quality of fuel and its effect on quality of power generation. List of thermal power stations in Maharashtra state with their capacities.</p> <ul style="list-style-type: none">●	9	17
3	Hydro Power Plant: <p>Block diagram and working of Hydro Power Station. Selection of site for hydro power stations.</p> <ul style="list-style-type: none">● Layout of hydro Power stations.● Types of Turbines & generators used. <p>List of hydro power stations in Maharashtra state with their capacities.</p> <ul style="list-style-type: none">●	7	16

4	<p>Nuclear Power Plant:</p> <ul style="list-style-type: none"> • Block diagram and working of Nuclear Power Station • Construction and working of Nuclear Reactor (Types) • Fuels used in Nuclear Power Station and its hazards. • List of Nuclear power stations in state & country with their capacities. 	6	15
5	<p>Size and Economics of power plant / power system:</p> <ul style="list-style-type: none"> • Types of load • Load requirements of an area, Load estimation • Economic forecasting of generation, Load curve, load duration curve & integrated load duration curve (maximum demand calculation.) Average demand (average load) maximum demand, base load, peak load & connected load calculation. Demand factor, load factor, diversity factor, coincidence factor, plant factor & plant use factor, Installed capacity and firm power • Size of power plant– choice of size of generators and number of generators. 	9	17
6	<p>Non-conventional energy sources:</p> <ul style="list-style-type: none"> • Types of non-conventional energy sources. • Solar Energy, Potential of solar energy, Photovoltaic effect for solar energy, Construction & materials used in solar photovoltaic cells, working & applications of solar energy. • Wind Energy, Selection of site for wind mills, Principle of electricity generation with the help of wind energy, Block diagram and working of Wind energy plant and its applications, List of major wind farms in the Maharashtra state with their approximate capacities. • Bio-mass & Bio-gas energy, Composition of Bio-gas & its calorific value, Traditional and non-traditional Biogas plants. • Geo-thermal Energy and its Applications. • Ocean energy, Ocean thermal Electric conversion, Energy from tides, Site requirements, Advantages and Limitations of Tidal power generation. • Fuel Cells: Construction, working and applications. 	11	20
Total		48	100

Assignments and Tutorials:

- 4 Assignments should be taken.
- A case study should be done on any one of the power stations in Maharashtra. (Thermal and Hydro)
- Visit to one of the power stations during academic session (Thermal or Hydro).

Learning Resources:-

Text Book:-

A Course in Electrical Power, 12th Edition by J B Gupta, S. K. Kataria and Sons.

Reference Books:-

- 1) Electrical Power, 13th Edition by S L Uppal, Khanna Publishers.
- 2) A Course in Electrical Power, 3rd Edition by Soni, Gupta and Bhatnagar, Dhanpat Rai and Sons.
- 3) Power System Analysis and Design, 3rd Edition by B R Gupta, S Chand and Company.
- 4) Generation of Electrical Energy, 2009 Edition by B.R. Gupta, S Chand and Company Ltd.

Course Name : Diploma in Electrical Engineering
Semester : Third
Subject Title : Electrical Workshop - I
Subject Code : DLEE2106

Teaching and Examination Scheme:–

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks	
L	T	P		Theory		Test	Total		P		OR		TW			
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min		
1	-	3	-	-	-	-	-	-	-	-	-	50	20	50	20	100

Objectives:-

The students should be able to:

- 1) Explain the importance of earthing in electrical equipments.
- 2) Explain the construction and working principle of different electric indicating instruments.
- 3) Do calibration of ammeter, voltmeter and wattmeters.
- 4) Explain common measurements and precautions to be taken in the installation of electrical equipment/gadget.

Syllabus

Part I:- Theory

Sr. No	Contents	L
1	Study of units used for different electrical quantities.	1
2	Principle and methods of Earthing used in high voltage electrical equipments.	2
3	Construction, working principle of induction, electrostatic, electromagnetic, moving coil, moving iron, dynamometer type meters.	4
4	Methods and importance of ammeter, voltmeter and wattmeter calibration.	3
5	Role of Electrical Contractor, Supervisor, Lineman, Apprentice Engineer in Electric Supply Board.	3
6	Earth and insulation measurement techniques.	3
	Total	16

Part II:- Practicals

List of Laboratory Experiments:-

- 1) Units
- 2) What is Earthing of high voltage equipment? How is it carried out?
- 3) Magnetic effects of electric current
- 4) Induction coil
- 5) Electrostatic meter
- 6) Moving coil meter
- 7) Moving Iron meter:
 - a) Moving vane type
 - b) Double vane type
- 8) Dynamo meter type meter
- 9) Calibration of Ammeter:
 - a) By comparison with a standard meter
 - b) By simple potentiometer
- 10) Calibration of voltmeter:
 - a) By comparison with standard meter
 - b) By simple potentiometer
- 11) Calibration of wattmeters:
 - a) By comparison with standard ammeter and voltmeter.
- 12) Who are electrical contractor, electrical supervisors, lineman, apprentices
 - a) What is contract?
 - b) Type of engineering contracts and their meaning
 - c) What is tender?
 - d) Different ways of writing tenders and meaning of each
 - e) Tender notice and Tender documents
 - f) What is Work Order?
 - g) Stages in preparing Tender documents.
- 13) Testing of Installation (New and extended)
 - a) Effectiveness of Earthing:
 - 1) Measurements of Earth's resistance by fall potential.
 - 2) Measurement of Earth's resistance by Earth tester.
 - b) Measurement of insulation resistance
 - c) Circuit Continuity

Learning Resources:-

Reference Books:-

- 1) Electrical Wiring, Estimating and Costing, 5th Edition by Dr. S.L.Uppal, Khanna Publisher

- 2) A Handbook of Electrical Wiring Estimating and Costing, 2008 Edition by Arora, R B Publications
- 3) Basic Electrical Installation Work, 3rd Edition by Trevor Linsley, Newnes, Butterworth-Heinemann Publishers.
- 4) Electrical Design Estimating and costing, 2009 Edition, by K B & Raina and S K Bhattacharya , New Age International(P) Limited.

Course Name : Diploma in Electrical Engineering
Semester : Third
Subject Title : Development of Life Skills
Subject Code : DTHU2107

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		Pract		Oral		Termwork		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
-	-	2	-	-	-	-	-	-	-	-	-	-	25	10	25

Objectives:-

1. To train students in overcoming stage fright, to attain composure, to organize thought process and develop voice modulation and body language.
2. To develop students' interpersonal skills and leadership quality, to improve their listening and persuasive skills, and train them in the ways of identifying the source of information, collecting and planning .
3. To prepare students for interview, make them aware of personal grooming and concept of time , to teach students positive thinking as an ongoing process, to have optimistic approach, , to cultivate right values and attitude.

SYLLABUS

Sr. No.	Contents	L
01	Oral Skills and Writing Skills <ul style="list-style-type: none"> • Elocution • Group Discussion • Presentations • Resume • Summarization 	4 5 6 2 2
02	Managerial Skills <ul style="list-style-type: none"> • Interview Techniques • Time Management • Manners & Etiquette • Body Language • Personality Development • Positive thinking 	2 2 2 2 3 2
	Total	32
03	Practical <ol style="list-style-type: none"> 1. Students deliver a prepared speech. 2. Group discussions conducted in class 3. Group of 6-7 students make a power point presentation 4. Assignments on resume writing and summarization 5. Mock interviews in class 	

	6. Role play by students.	
--	---------------------------	--

Term Work- Students should submit term work file based on above topics.

Learning Resources:-

Text Book:

1. Business Communication- Raman Meenakshi, Oxford, India, First edition, 2008

Reference Books:-

1. Contemporary Management, Gupta C. B., APH, New Delhi, First edition, 1992
2. Organisational Behaviour, Sekaran Uma, Tata Mcgraw Hill, New Delhi, Second edition, 2008
3. Technical Communication, Raman Meenakshi, Sharma Sangeeta, OUP, India, Second impression, 2004

Course Name : Diploma in Electrical Engineering
Semester : Third
Subject Title : Professional Practices - I
Subject Code : DTHU2108

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
-	-	2	-	-	-	-	-	-	-	-	-	-	25	10	25

Objectives:-

Student will be able to:

- 1) Acquire information from different sources
- 2) Prepare notes for given topic
- 3) Present given topic in a seminar

List of Activities:-

1) Market Survey :

The complete classroom strength will be divided into groups of six students each. Each group will select **ONE** electrical product (for eg. Domestic Ceiling Fan, Pump, Geyser (Water Heater), Microwave Oven, Television & Radio Receivers, Personal Computer, LapTop, Home Theatre System, Voltage Stabilizers for monitoring AC supply voltage, Uninterrupted Power Supply (UPS) systems, Spike Guard Suppressors for Computers, Washing Machine, Electric Iron, **etc.**) The group will collect information from market of various brand names manufacturing that product, general and technical specifications of the product, cost of the product, after sales service facility, warranty and other details.

2) Product Report :

A report is to be prepared by each group based on the market survey done in 1), and submitted as term-work.

3) Seminar :

Individual student from each group has to give seminar in the classroom on their surveyed product and submit the seminar report as term-work.

4) Study/Calculation of Residential Electricity Bill Charges :

To be done of individual house (residence) by each student.