VOCATIONAL HIGHER SECONDARY

TEACHERS' SOURCE BOOK

MAINTENANCE AND REPAIRS OF RADIO AND TELEVISION

FIRST YEAR

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PREFACE

Dear Teachers,

Vocational Education caters to the demands of the society. When the demands of the society is fulfilled, the individuals needs are also met with. So in the first section of the 21st century, Education is aimed at revolutionary changes through vocationalisation. Only through this stream we can construct a powerful nation, particularly in material development. The main feature of the new system of education is the participation of the learners. Now it is altered from the teacher centred to student centred. The new curriculum introduces learning by doing and from direct experience. In the new system there are opportunities for individual attention and special care. A student cannot be judged only by a single activity or a written examination. So the new system highlights continuous evaluation. Different items are included in the process of continuous evaluation. Through these different activities the skill of applications and synthesis is evaluated. The altogether development of personality is taken into consideration in the new curriculum.

The MRRTV course is formulated to equip the students with the skill of dealing with electronic equipments. This sourcebook on MRRTV is designed to cater to the needs of the teachers to plan and introduce new learning strategies in electronics and thereby achieving the constructiveness of the course. For success the ability and devotedness of the teacher is also needed. The new approach deserves sincerity and persuasiveness of all those who indulge in this activity.

I feel happy over the successful completion of the sourcebook. More advice and suggestions are kindly welcomed.

With regards,

Thiruvananthapuram
25.11.2005

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Director
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Part I

GENERAL APPROACH

Introduction

The ultimate aim of education is human refinement. Education should enable the learner to formulate a positive outlook towards life and to accept a stand which suits the well being of the society and the individual as well.

The attitude and potential to 'to work' has determined the destiny, progress and cultural development of the human race. As we all are aware, the objective of education to form a society and individuals having a positive work culture. The educational process expected in and outside our formal schools should concentrate upon inculcating concepts, abilities, attitudes and values in tune with these 'work culture.' Hence vocationalised education cannot be isolated from the main stream of education. In anthor sence, every educational process should be vocationalised. However, due to our inability to utilise the resources wisely, scarcity of job oppurtunities is a severe issue of the present society. For overcoming this deep crisis, emergent techinques have to be sorted out and appropriate researches have tobe seriously carried out. It is in the sence that the content and methodology of vocational Higher Secondary Education have to be approached.

The Vocational Higher Secondary course was envisaged as a part of the National Policy on Education with the noble idea of securing a job along with education. The relevance of Vocational education is very great in this age of un employment. This education system, which ensures a job along with higher education, stands aloof from other systems of education.

A learning enviornment which ensures vocational aptitude, vocational training, basic life skills, competencies related to different subjects, appropriate values and attitudes and existential readiness has to be provided here.

The curriculum should be one which recognises the specific personality of the learner and should develop it in a desirable way. It should provide opportunity to imbibe novel ideas to follow a ctritical approach and for learning through experiences.

The competency to transform ones own resources for the betterment of the society and the individual is to be ensured in each individual. Training in the sense of equality, democratic sense, enviornmental consiousness and devotion to the constitution is an inseparable factor of the curriculum.

The need of a systematic curriculum is prevailing in vocational subjects. A scientifically structured curriculum incorperating the unique features peculiarity of Kerala ensuring the possibility of higher education and utilising the national and international possibilities of employment is required.

The new curriculum should be capable of assimilating the life skills, scientific temper, attitude of co-existence, leadership qualities and mental health to face the challenges of life. It should be capable of strengthening the competencies imbibed by the learners up to the tenth class.

A curriculum for selecting vocational areas according to the aptitude of the students, learning it in depth, acquire general awareness in the basic areas and to secure jobs has become the social need of the day. A learner centred, process oriented, need based vocational curriculum is envisaged.

What is learning?

- Learning is construction of knowledge and so it is a live and continuous mental process.
- Learning is a process of advancement through adding and correcting in the light of comparing the new issue with the previously learned concepts.
- Learning takes place as a part of the effort to solve problems.
- Learning takes place by assimilating bits of knowledge into ones own cognitive structure.
- Learning is not a linear process. It is a spiral process growing deeper and wider.
- Learning is an intellectual process rather than the mere memorisation of facts. Learning is a conglomeration of a variety activities like problem analysis, elucidation, critical thinking, rational thinking, finding out co-relations, prediction, arriving at conclusions, applications, grouping for other possibilities and extracting the crux. When opportunities are proviced for intellectual processes learning will become effective and intellectual ability will get strengthend.

Theoretical foundations of learning

Education is the best device that can be adopted for creation of a new society. It should be democratic in content and process and should acknowledge the rights of the learner. It should also provide opportunity for better citizenship training. The concept of equality at all areas should get recognition in theory and practice.

There should be consious programme of action to develop nationality, humaness and love and against the enchroachment of the sectarianism of caste and religion.

The learner should be able to take firm steps and deferred against the social crisis like privatisation, liberalisation, globalisation etc and against all kinds of dominations.

They should develop a discrimination to use the acquired learning as a liberative weapon.

They should be able to view education and life with the perspective of social well being.

They should get opportunity to recognise that co-operation is better than competition and that co-operation is the key to social life and culture.

A basic awareness of all the subjects needed for life essential for all students.

The remnants of perspectives formed in us during the colonial period still influence our educational philosophy. The solution to the present day perplexities of the society which approaches education on the basis of competitions and marketisation is only a comprehensive view of life.

It is high time that education was recognised on the basis of the philosophy of human education. The human approach to education has to reflect in its content, learning process and outlook. The perspective of 'learning to be ' and learning to live together as expressed by the UNESCO and the concepts of existentialist intelligence intrapersonal and interpersonal intelligence.

The basis of new approaches on curriculum, teaching- learning process are derived from the developments place in the east and west of the world.

When we begin to see the learner at the centre of the learning process, the teaching process has to be changed timely. It is the result of the rapid growth and development of Science and Technology and Pedagogy. If we want to undergo the changing process, we have to imbibe the modern hypothesis regarding learner, they have;

- Great curiosity
- Good imagination
- Numerous other qualities and interests
- Independent individuality
- Interest in free thinking and working in a fearless atmosphere.
- Have interest in enquiring and questioning.
- Ability to reach conclusions after logical thinking.
- ability for manifest and establish freely the conclusions arrived at.
- Interest for recognition in the society.
- Determination to face the interference of society and make components which is a part of social life.

When we consider the learning system, the domains to be stressed in education according to the modern development becomes relevant.

The ***knowledge*** domain consists of

- Facts
- Ideas
- Laws
- The temporary conclusions and principles used presently by scientists.

The learning is a process. The continuous procedures we undergo to reach a particular goal is process. The skills which are parts of the process to analyse the collected ideas and proofs and come to a conclusion is called *process skills.* Some important ***process skills*** are,

the skills;

- To observe
- To collect data and record
- To classify
- To measure and prepare charts
- To experiment
- To predict
- To recognise and control the variables
- To raise questions
- To generalise
- To form a hypothesis and check.
- To conclude
- To communicate
- To predict and infer
- To use tools.

Observation *is the process of acquiring knowledge through the senses. It is purely objective oriented. Learning experiences which provide the opportunity to use all the senses may be used.*

The process of grouping is known as ***classifying****. Starting from simple groupings of data, it can extend to the level of classification into minute sub-groups.*

In addition to this, consider the skills related to ***creative domain*** also, they are skills:

- To visualize
- To connect facts and ideas in new ways
- To findout new and uncommon uses of objects
- To fantasize
- To dream
- To develop creative isolated thoughts

Creativity is an essential component of process and activities. The element of creativity is involved in finding out problems, formation of hypothesis, finding 'solutions' to problems etc. Through activity oriented learning experiences, opportunities to express creativity can be created.

Again, the following factors consisting in the ***Attitudinal domain*** are also important as;

- Self confidence
- Love for scientific knowledge
- Attitude to know and value history
- Respect human emotions
- Decide with reasonable present problems
- Take logical decisions ragarding personal values

'Hypothesis' is a temporary conclusion drawn using insight. Based on knowledge and experiences relating to the problems the causes and solutions can be guessed.

As regards the ***application domain*** the important factors are the ability to:

- observe in daily life examples of ideas acquired.
- take the help of scientific process to solve the problems of daily life.
- choose a scientific life style
- connect the ideas acquired with other subjects.
- integrate the subjects with other subjects.

Some basic stands have to be taken on the new scientific knowledge about intelligence learning and teaching. When such basic concepts are accepted changes are required in the following factors.

- The vision, approach, structure and content of the curriculum.
- The vision, approach, structure and content of the textbooks.
- Role of the teacher and the learner.
- Learner atmosphere, learning materials and learning techniques.

Some scientific pespectives accepted by modern world in educational psychology are given below.

Constructivism

This approach puts forward the concept that the learner constructs knowledge. New knowledge is constructed when ideas are examined and practiced in new situations relating them with the previously acquired knowledge and experience. That is assimilated into the congnitive structure of one's knowledge. This method which gives priority to critical thinking and proble solving provides opportunity for self motivated learning.

Social Constructivism

Social constructivism is a sub section of constructivism. Knowledge is formed, spread and imbibed and it becomes relevant in a social enviornment. Interactive learning , group learning, co-operative participatory learning, all these are concepts put forward by social constructivism.

The main propounders of constructivism are piaget, vygotsky and Bruner.

Discovery learning and interactive learning have prime importance. Learning takes place as a part of the attempt for problem solving. The activities of a learner who confronts cognitive disequilibrium in a learning situation when he tries to overcome it is leades to the renewal of cognitive structure. It is through this process construction of new knowledge and the assimilation of them that learning take place. Observation and enquiry are unavoidable factors. The learner advances towards new areas of acquisition of knowledge where he tries to compare his new findings with the existing conceptions.

Learning is a live mental process. Rather than the ability for memorisation of facts cognitive process has to be given emphasis. The process of problem analysis, elucidation, critical thinking, rational thinking, finding out co-relation, prediction, hypothesis formation, application, probing for other possibilities, extracting the crux and other processes are of critical importance in learning.

Constructivism gives greater predominonce to co-operative learning. Social and cultural factors influence learning. Sharing of knowledge and experience among learners, collective enquiry, assessment and improvement, group activity and collaborative learning, by sharing responsibilities with the objective of public activity, provide opportunity for effective learning.

In learning internal motivation is more important than external motivation. The learner should have interest and initiative in learning. Learning situation should be capable of forming a sense of ownership in of the learner regarding the learning process.

Learning is not a linear process. It progresses in a spiralled way advancing deeper and wider.

Learner-his nature and features

The learners in standard XI has undergone a learner centered and process oriented learning experience up to X standard. He is adequately competent to select vocational subjects according to his aptitude and interest and to acquire higher education and profession as he wishes. The aspirations about future life is framed in this particular age foreseeing national and international job oppurtunities. Some of the peculiarities of the learner at this stage are:

- Physical, intellectual an emotional planes are intensive changes during this age and their reflections can be observed.
- Ability to enquire, discover and establish cause-effect relationship between phenomena.
- Readiness to undertake challenges.
- Capacity to shoulder leadership roles.
- Attempt to interprest oneself.
- Susceptibility to different presseures.
- Doubts, anxities and eagerness about sex.
- Longing for social recognition.

Needs of the learner

- To make acquaintance with a job through vocational education.
- To acquire more knowledge in the concerned area through higher education.
- To recognise and encourage the peculiar personality of the later adolescent period.
- To enable him to defend against the unfavourable circumstances without any help

Role of the Learner

- Active participant in the learning process.
- Acts as a researcher
- Sharer of information
- Sharer of responsibilities
- Collects information
- Takes leadership
- Involves in group work
- Acts as a co- participant
- Observes his environment
- Experiments and realises
- Makes interpretations and draws inferences.

Role of the Teacher

The teacher should;

- consider the 'Stress and strain' of the teenagers
- understand the socio- economic and cultural background of the students.
- promote and motivate the students to construct knowledge.
- arrange proper situations to interact in and outside of the classroom.
- guide the students by explanations, demonstrations etc.
- promote opportunity for co-operative learning and collaborative learning.
- facilitate interpersonal and intra-personal interactions.
- act as a democratic leader.
- act as a problem solver
- effectively guide the students for the selection and conduct of various continuous evaluation elements.
- continuously evaluate the progress of the learners.
- gives scaffolding/support wherever necessary.
- motivate for learning
- promote divergent thinking.
- act as a democratic group leader.
- act as a co-learner
- gives variety of learning experiences.
- be a constant student
- facilitate for reference/data collection
- have a clear under standing about the age, needs, peculiarities, abilities, nature, aptitude etc. of the learner.
- have the ability to motivate the learner in order to acquire and enrich their knowledge.
- be a guide to the learner in developing insights and creating responses on current affairs.
- be capable to lead the learner into a variety of learning methods and process based on curricular objectives.
- be a link between school and community.
- be a good organiser, guide, friend, philosopher and co-learner.
- have an inter disciplinary approach in learning activities.
- be able to guide the learner in his/her career prospects based on his interest aptitude and ability.
- be impartial and democratic.
- provide ample experiences to attain the basic values and objectives of the curriculum.

New Concepts of Learning

1. Discovery Learning

The teacher has to create a motivating atmosphere for the learner to discover concepts and facts, instead of listening always. Creating occasion to progress towards discovery is preferred. Instead of telling everything before and compelling to initiate the models, situations are to be created to help the children act models as themselves.

2. Learning by discussion

That discussion leads to learning is Burner's theory. Here discussion is not opposing each other. It is a sharing on the plane of ideas. New ideas are arrived at by seeking explanations, by mutual giving and taking of ideas and by problem solving.

3. Problem solving and learning

Only when the learner feels that some thing is a problem to be solved that he takes the responsibility of learning it. It is an inborn tendency to act to solve a problem that causes cognitive disequilibrium in a particular area. It is also needed to have confidence that one is capable of doing it. The problems are to be presented in consideration of the ability and level of attainment of the learner.

4. Collaborative learning

This is the learning in which the responsibilities are distributed among the members of the group keeping common learning objectives. The common responsibility of the group will be successful only if each member discharges his duties. All the members will reach a stage of sharing the result of learning, equally through the activity with mutual understanding. The teachers who arrange collaborative learning will have to make clear the responsibilites to be discharged. This is possible through the discussion with the learners. Collaborative learning will help to avoid the situations of one person working for the whole group.

5. Co-operative learning

This is the learning in which the learners help one another. Those who have more knowledge, experience and competency, will help others. By this exchange of resources the learners develop a plane of social system in learning also. As there are no high ups and low ones according to status among the learners they can ask the fellow students doubts and for helps without any hesitation or in hesitation Care should be taken not to lead this seeking of help to mechanical copying. It should be on the basis of actual needs. So even while encouraging this exchange of ideas among the members of the group cautions acceptance is to be observed as a convention. There should be an understanding that satisfactory responses should come from each member and that the achievement of the group will be assessed on the basis of the achievement of all the members

6 Zone of Proximal Development

Vygotsky observes that these is a stage of achievement where a learner can reach by himself and another higher zone where he can reach with the help of his teachers and peers and elders. Even though some can fulfil the learning activity by themselves there is the possibility of a higher excellence. If appropriate help is forth covering every learner can better himself.

7 Scaffolding

It is natural that the learner may not be able to complete his work if he does not get support at the proper time. The learner may require the help of the teacher in several learning activities. Here helping means to make the learner complete the activity taking responsibility by himself. The teacher has to keep in mind the objective of enabling the learner to take the responsibility and to make it successful.

8 Learning: a live mental process

Learning is a cognitive process, only a teacher who has an awareness as to what the cognitive process is alone can arrange learning situations to the learner to involve in it. Learning can be made effectively and intellectual sharpness can be improved by giving opportunity for the cognitive processes like reminding, recognising compromising , co- relating, comparing, guessing, summarising and so on. How is cognitive process considered in language learning? Take guessing and prediction for example.

- Guessing the meaning from the context.
- Guessing the content from the heading.
- Predicting the end of the story.
- Guessing the incident, story from the picture.
- Guessing the facts from indications.
- and other such activities can be given the following activities can be given for the cognitive process of summarisation.
- Preparation of blue print.
- Preparation of list.
- Preparation of flow chart.
- Epitomising in one word.
- Giving titles and so on.
- Symbols, performance of characters indications, lines of a poem, tables, pictures, concepts, actions, body language and such things can be given for interpretation. Process based language given for interpretation. Process based language learning has to give prime importance to the cognitive process.

9 Internal motivation

Internal motivation is given more importance than external motivation. The teacher has to

arouse the internal motivation of the learner, A person internally motivated like this alone can immerse in learning and own its responsibility. How motivating is each of the activities is to be assessed.

10 Multiple intelligence

The Theory of Multiple Intelligence put forward by Howard Gardener has created a turning point in the field of education. The National curriculum document has recommended that the curriculum is to be designed taking into consideration of this theory.

Main factors of the intellect :

1. Verbal/linguistic Intelligence

Ability to read and write, making linguistic creations , ability to lecture competence effective a communication , all these come under this . This can be developed by engaging in language games and by teaching others.

2. Logical /mathematical Intelligence

Thinking rationally with causes and effect relation and finding out patterns and relations come under this area, finding out relations and explaining things sequential and arithmetical calculations are capable of developing this area of intelligence.

3. Visual /spatial Intelligence

In those who are able to visualise models and bringing what is in the imagination into visual form and in philosophers, designers and sculptors this area of intelligence is developed. The activities like modelling using clay and pulp, making of art equipments, sculpture, and giving illustrations to stories can help the development of this ability.

4 Bodily Kinaesthetic Intelligence

The activities using body language come under this. This area of intelligence is more developed in dancers and actors who are able to express ideas through body movements and in experts in sports, gymnastics etc.

5 Musical Intelligence

This is an area of intelligence which is highly developed in those who are able to recognise the different elements of music in musicians and in those who can here and enjoy songs. Playing musical instruments, initiating the songs of musicians, listening silently to the rhythms and activities like this are capable of developing this area of intelligence.

6 Interpersonal Intelligence

Those in whom this area of intelligence is developed show qualities of leadership and behave with others in a noble manner. They are capable of understanding the thought of others and carrying on activities like discussion successfully.

7 Intrapersonal Intelligence

This is the ability to understand oneself. These people can recognise their own abilities and disabilities. Writing diaries truthfully and in an analysing way and assessing the ideas and activities of others will help developing this areas of intelligence

8 Naturalistic Intelligence

A great interest in the flora and fauna of the nature, love towards fellow beings interest in spiritual and natural factors will be capable of developing this area.

9. Existential Intelligence

The ability to see and distinguish ours own existence as a part of the universe, ability to distinguish the meaning and meaninglessness of life, the ability to realise the ultimate nature of mental and physical existences, all these are the peculiarities of this faculty of intelligence.

10. Emotional Intelligence

The concept of emotional intelligence put forward by **Daniel Golman** was used in framing the new curriculum. The fact that one's **Emotional Quotient (E.Q)** is the greatest factor affecting success in life is now widely accepted. The teacher who aims to focus on improving the emotional intelligence of students need to concentrate on the following.

i) Ability to take decisions

Rather than imposing decision on students while planning and executing activities, the students may be allowed to take part in the decision making process. Taking decisions through open discussion in the class, inviting students suggestions on common problems etc. are habits to be cultivated.

ii) Ability to reach consensus

- When different opinions, ideas and positions arise the students may be given the responsibility to reach a consensus.
- Imaging what would be the course of action in some situtations, allowing to intervene in a healthy way in problems between individuals.

iii) Problem solving

- Developing the idea that there is reason and solution to any problem.
- Training in finding reasons for problems.
- Suggesting solutions through individual or group efforts.
- Discussing social problems.
- Analysing the shortcomings in methods to solve problems.

Whether plastic can be banned within school premises can be given as a problem. Group discussion will provide reasons and solutions. Problems which can influence classroom learning and for which the learner can actively contribute solutions need to be posed.

- Self criticism, evaluation
- Ability to face problem-situation in life
- Thinking what one would do if placed in the situation of others, how one would respond to certain experiences of others - All these foster the growth of emotional intelligence.

iv) Life skills

Life skills need to be given a prominent place in education. W.H.O. has listed ten skills required for success in life.

- Self awareness
- Empathy
- Inter personal relations
- Communication
- Critical thinking
- Creative thinking
- Decision making
- Problem solving
- Copying with emotion
- Copying with stress

The new curriculum addresses these areas.

Knowing the characteristics of the learner, role of the teacher and how to use the teachers handbook help the teacher to plan and effectively implement learning activities.

Objectives of the Vocational Higher Secondary Curriculum

- To facilitate higher education while giving opportunity to enter in the field of employment.
- To develop enviornmental awareness, sense of national integration, tolerence and human values so as to ensure social and cultural improvement.
- To enable the learner to find on his own employment.
- To inculcate mental courage in the learner to face unfavourable situations.
- To make human resource development possible.
- To enable the learner to understand social problems and to react appropriately.
- To develop the learner to identify and develop his own competencies.
- To develop vocational aptitude, work culture and attitude in the learner so as to provide useful products and services to the society.
- To create an awarenss about mental and physical health.
- To acquire awareness about different job areas and to provide backgrounds for acquiring higher level training in subjects of interest.
- To develop possibilities of higher education by creating awareness about common entrance examinations.

- To provide situation for the encouragement of creative thinking and organising training programmes in each area, creative abilities and to develop artistic talents.

Nature of Approach

The learning device is to be organised in the selected vocational subjects in such a way that adequate practical experience should be given, making use of the modern technology. The development in each area on the basis of information technology is to be brought to the learner. The work experience in the respective fields(OJT, Field trip, Production/Service training, Survey, Workshop, Exhibition, Youth festival, Physical fitness etc.) are to be adjusted suitable to the learning and evalution process. The participation and leadership of the students in planning and execution is to be ensured through this kind of activities. Social service is to be made a part of the course.

Approach towards Vocational Higher Secondary Education

The learning methodology has to be organised so as the learning provide adequate practical thinking on the opted vocational subject utilising the new technology. The development of information technology should be made available in each sector. Work experience, OJT, Field trip production, Service cum training centre, Survey, Workshops, Exhibitions, Youth festivals, Physical fitness etc should be systematised well appropriate to learning and evaluation. Learner participation should be ensured in the planning and implementation of these activities. Social service should be a part of the course. If a learner has to change his school, he should be provided an oppurtunity to continue his studies in the new school. While considering criteria for admission to higher courses, grades of vocational subjects should also be given due weightage. In tune with the changes in the Vocational Higher Secondary Education changes should be ensured in the field of higher education.

The teachers have to take special care in arranging learning activities for the development of all the faculties of intelligence.

Learning activities and learning atmosphere.

A proper learning atmosphere is essential for the betterment of learning activities.

They are:

- Proper physical environment
- Healthy mental atmosphere
- Suitable social atmosphere
- Active participation of PTA, Local bodies and SRG
- Reference materials and visual media equipments.
- Academic monitoring
- School Resource Group (SRG)

SUBJECT APPROACH

Introduction

The eternal search of the mankind for better living conditions and comfort has forced a radical revolution in the field of science and technology. Starting from the invention of wheels, it has passed through many stages and steps to enter into the era of computers and information technology. Though the progress was steady and gradual at the initial stages, non in the modern times, when the world is dashing from electronics to photonics, the developments has acquired an unimaginable pace and depth. Neverthless to say, for any one who glimpses around these changes it is very clear and factual that electronics serves the foundation for most of these developments. No matter, if it is simple calculator or a highly sophisticated space craft. This undebatable relevance of electronics in the modern world has ofcourse paved the way for the creation of a large number of opportunities in the related fields.

In this context, the vocational higher secondary course in MRRTV is so designed as to enable the learner to develop the necessary skills to establish himself as a prominant service technician in this field. With this concept in mind, the subject is given a clean orientation towards practical applications. Any how theoretical explanations and hypothesis are supplemented when and where required.

Curriculum Objectives

- To familiarise the learner with various types of electronic components, circuits and devices
- To enable the learner identify different components and devices, read their values from the code printed on them and test them for proper functioning.
- To understand the function of various components in a complex circuit and the interdependence or relationship between them.
- To familiarise the learner with special devices such as LED, SCR,..... etc and enable him to test them and get acquainted with their applications.
- To introduce the learner the latest technologies and modern trends in this field.
- To familiarise the learner with some of the basic circuits in electronics such as

amplifiers, oscillators,switching circuits, ... etc. and create an idea about its working.

- To enable the leaner to get acquainted with various types of d.c power supplies.
- To introduce the learner to the field of integrated circuits and digital technologies and let him familiarise with some of the common IC chips.
- To introduce the learner to the world of sound and familiarise him with few acoustic transducers such as microphones and loudspeakers.
- To create a basic idea within the learner about the magnetic recording of sound.
- To create an awareness about the basic, principle involved in the optical recording of sound.

In brief the curriculum is framed to ahieve the objective of equipping the learner with a sound knowledge of the basic theorems, components, devices and circuits that will be necessary and sufficient to proceed to the next stage where it is envisaged to develop the skills for servicing different electronic equipments such as radio, television, tape recorder, music systems, VCD player, DTH systems ..... etc.

Contents of the Course

i. Syllabus

ii. Learning Approach

Any modern curriculum visualises learning as a continuous and smooth process leading to a behavioural change in the learner. In that sense, the learner himself is the creator of knowledge. Real knowledge is a result of factual experiences and is cemented through activities in which the learner should be the main participant. As far as learning of technical subjects are concerned, this is more significant. Because only that knowledge acquired through real practical or working experience can be effectively applied to tackle a needy situation.

In general the curriculum envisages to promote three basic qualifiers - multiple intelligence, constructivism and emotional quotient(E.Q) - of the learner. That is, the learning process should contribute for the overall development of various facts of multiple intelligence such as linguistic intelligence, logical intelligence, visual intelligence, kinaesthetic (bodily) intelligence, interpersonal intelligence, intra-personal intelligence, musical intelligence and naturalistic intelligence of the learner. Secondly the various methods adopted for learing should be helpful to develop the constructivism within the learner. Methods, like Inquiry learning, Problem solving learning ..... etc are highly useful in this regard. Last but not the least important is the improvement of the emotional quotient of the learner. Emotional quotient (E.Q) of a person is

an indicator of his ability for decision making, problem solving, investigative thinking and innovative approach which lead to the leadership qualities within him. The learning methods should enhance these qualifies and raise the E.Q of the learner.

Apart from above listed personal aspects, another significant factor that should be considered while framing a curriculum is the social impact on the outcome of the learning process. The knowledge and skill acquired by the learner must be contributive for the overall development of the society and should serve as a catalyst for the social development of the region or area where he resides.

To achieve the above goals, the learning process must be compatable and flexible to face the needs and necessities of that particular region. It should be always ready to lend the ears to catch the beats of the social and economical environment prevailing there. That is why the vocational higher secondary course adopted a locally specific, participatory curriculum based on a need analysis survey. To brief up, it can be emphattically said that, the successful completion of the course will help the learner to find his livelyhood from his own surrounds and will ensure a respectable identity within the society. Moreover, that will contribute, an enthusiastic, self-reliant model citizen who is always at will to care for others and D extend his services to his fellow people, to the society.

Participatory Curriculum

Role of the teacher

(i) Facilitator- who encourage the students to identify the problems and to tackle them fruitfully.

(ii) Motivator- who motivates the students to accept challenges enthusiastically.

(iii) Friend- who develops a sound relationship with the students in and outside the class-room

(iv) Leader- who is willing to share his views and impart his ideas while caring other's suggestions

(v) Resource Person- who is mastered in the subject and well-versed in the modern stratagies of learning.

(vi) Scaffolder- who brings the students to the expected level of learning when they fail to achieve it by themselves.

(vii) Evaluator- who evaluates the performance of the students at different stages and motivate them to try for better heights.

(viii) Co-learner- who is a co-learner in the constructive learning process.

(ix) Researcher- who applies his own stratagies and skill to find solution for problems faced by the learners.

(x) Life time learner- who updates his knowledge time to time, polishes it through different activities and tries to acquire more knowledge and skill always.

Role of the learner

(i) Enthusiastic participant in the learning process.

(ii) Present innovative ideas of their own.

(iii) Active participant in group activities.

(iv) A nice co-participant.

(v) Willing to share ideas and responsibilities.

(vi) A good leader.

(vii) A good observer and experimentalist.

Learning Atmosphere

For the effective implementation of the modern learning methods and stratagies, it is of paramount importance to setup the right atmosphere or environment for learning. The environment should satisfy the physical, psychological and social requirements to attain the desired results. A well-furnished class-room, well-equipped laboratory, a good library, a resource room, internet facilities, LCD and OHP projectors, a play ground, an auditorium...etc are some of physical requirements to create the right atmosphere. Psychological factors include the co-operation of the management, principal, teachers, students, parents and the society, a disciplined campus atmosphere and facilities for counselling and guidance. The availability of academicians, industrial experts and other resource persons, active support of the PTA, local bodies and social workers...etc are the social requirements for a good learning atmosphere.

Modern Learning Methods

According to the modern concept, the learning process will be more effective and fruitful if the following methods are adopted:

(i) Problem solving method – Experimentation in the lab, project, assignments.....etc

(ii) Discovery learning method - Project, Feild visit, Assignment

(iii) Co-operative learning method - Group discussion, Debate, Seminar

(iv) Inquiry learning method - Survey, Reference work in library or internet reports...etc

(v) Collaborative learning method - Group discussion or analysis.

TEACHING AND LEARNING STRATEGIES

1. Electronic Counsil

To meet the objectives of activity – based learning envisaged in participatory curriculum, it is very much essential to extend the learning activities to outside the class-room. A counsil or club may be formed to arrange these activities and co-ordinate them effectively. The counsil should be formed with the principal as the chief patron and the vocational teacher as the assistant. Organizing responsibilities may be shared by the student members. Due representation from the teaching staff and students from other streams must be observed. The main objectives of the council should include the following:

- Create awareness about science and interest in electronics.
- Highlight the role of electronics in the present world.
- Create awareness about the misuse of modern technology
- Arrange seminars by experts.
- Extend the activities for social work
- Materialise simple projects
- To pick out talented students and encourage them.

2. Group Discussion

Group discussion is a very effective co-operative learning method in which ideas are shared and new concepts are created. It should be conducted with the active involvement of the teacher. How to conduct a group discussion:

- Arrange the class-room in a convenient way.
- Divide the students into small groups of four or five each.
- Present the topic before the students (Write it on the black board)
- Emphasise the lead points.(Write them on the board)
- Start the discussion.
- Make sure that all the students are participating.
- At the end the groups are asked to present their points and the teacher should consolidate the various points of discussion.
- Ask the students to prepare a report on the discussed points individually.

3. Seminar

It is also a co-operative learning method. Actually it is a meeting of a group of members who study a particular topic in detail, to share their views and ideas. Seminar can be conducted either by an individual or by a group of students. The teacher should select the topic and assign it to a person or group. The different stages in conducting a seminar are listed below.

(i) Selection of a particular topic

(ii) Assigning the topic to a person or a team.

(iii) Collection of information or data.

(iv) Preparation of a rough draft for the reference of the teacher.

(v) Finalisation of the paper.

(vi) Program sheduling (Fix the date, time and venue for paper presentation)

(vii) Seminar paper presentation.

(viii) Discussion or interaction from others.

(ix) Summing up the deliberations.

(x) Evaluation / Feedback

(xi) Preparation of final report.

4. Debate

Debate is a collaborative learning method in which arguments are presented by two groups – one favouring and the other opposing. Since arguments can be raised only with a sound knowledge of the topic, it creates more depth in knowledge and also develop the communicating or presentation skills of the students. The important stages of conducting a debate are given below.

(i) Select a suitable topic for the debate.

(ii) Select the two panels.

(iii) Select the moderator (Intially the teacher should be the moderator)

(iv) Instruct the teams to collect maximum information / data

(v) Conduction of the debate.

(vi) Conclusion by the moderator.

5. Brain storming

The brainstorming method is a very effective and interesting stratagy for learning through problem solving. Here the teacher identifies a problem and present it before the students inviting their ideas for solving it. This method is very helpful to develop communicating skills in the students and to raise their level of confidence by giving aknowledgement for their ideas or

suggestions. It also lead to quick and innovative ideas and concepts. The general guidelines or rules to be observed to make the brainstorming method much effective are:

(i) Every response should be welcomed. No response or idea is wrong

(ii) Welcome as many responses as possible.

(iii) No criticism of ideas should be allowed.

(iv) Allow to work on other's ideas and suggestions.

The various stages of conducting the brainstorming method are:

(i) Presentation the problem (Write it on the black board)

(ii) Provide relevent background information

(iii) Record the ideas from the learners (Write them on the board)

(iv) Combine similar ideas.

(v) Evaluate each idea or solution.

(vi) Select the best idea or solution (If used as an instruction stratagy, this step is not necessary)

6. Assignment

Assignment is inquiry learning stratagy which leads to the deep study of a particular topic through inquiries in different ways – by surveyiing, by referring books or internet, by conducting interviews with experts by observations or research. After conducting the study a detailed report containing the different areas of study and including the necessary data or information should be presented to the teacher. The teacher should give necessary guidelines for conducting the steady and monitor the progress continuously. The report should be discussed in detailed and necessary corrections or changes should be incorporated. The general procedure for completing an assignment are:

(i) Select a suitable topic. (The topic should be slightly above the standard of the syllabus prescribed for the course and should extend the study to a higher level)

(ii) Specify the time or period alotted for completing the assignment

(iii) Mention about the depth of treatment intended, areas and details to be covered.

(iv) Give suggestions about the resources, method of inquiry....etc

(v) Conduct the study and collect relevent data/ information

(vi) Prepare a rough draft and submit it to the teacher

(vii) Present the original paper.

7. Project

Project is the planned execution of a specific task or idea through various activities

contributive to the learning process. It may otherwise be imagined as the materializations of the knowledge and skill, the learner has acquired through the learning process. Moreover it is a scientific inquiry to choke out solution for a particular problem. A project is a strong indicator of the depth of knowledge of the learner, observatory skills, leadership qualities, ability to work as a team and the decision making capacity while dealing with a problem. Many factors are to be considered while materialising a project. In general it can be said that a project should be 'SMART'

Specific task oriented.(The task or objective should be clear)

Measurable using standard indicators.(Should be compatable when compared with commercial models)

Accessable (The task should be attai

Resource bounded

Time bound

The different stages involved in conducting a project work are:

(i) Feel the problem

(ii) Define the objective

(iii) Form the team

(iv) Plan the work:
- (a) Formation of the hypothesis
- (b) Identification of the tools and methods
- (c) Identification of the source
- (d) Estimation of the cost

(v) Execute the project

(vi) Prepare the report

(vii) Present the project

The report should contain the following details:

- Title of the project (Front Cover)
- Names of team members
- Names of the guide
- Names of the institution
- Year

- Certification from the guide
- A brief summery of the project
- Acknowledgements
- Introduction (Clarifying the reason for selecting the topic and illustrating the back-ground work involved)
- Objectives
- Methods and tools
- Results
- Conclusion
- Recommended suggestions
- Sources of References
- Appendix

8. Survey

Survey is a co-operative inquiry learning method that can be adopted for extending the learning process outside the class-room to the actual site of the problem. This method is highly useful in getting more practical exposure and work-site knowledge. That also develops the observatory and communicating skills of the learners. Following steps may be employed for conducting the survey.

- Identify the problem
- Fix the objectives
- Select the team
- Identify the sources and tools
- Conduct the survey
- Prepare the report
- Present the report

9. Field Visit

Field visit is a very effective method to create the awareness about the actual worksite situation among the learners. That also will give them more exposure to the latest technologies and modern trends. Beside that will help the learner to identify the problems faced while doing the work in a job atmosphere as compared to the practical work in a laboratory. Before conducting a visit, the learners should be given an awareness session about the objectives of the trip, the data/information to be collected and the experiences to be gathered.

10. On – the –Job Training (OJT)

This method is introduced quite intentionally to provide the learner with the experience of working in an actual situation. Then only he will be aware of the demands of the job atmosphere as compared to those in a learning environment. Considering that the vocational higher secondary course is intended to develop the working skill and practical proficiancy of the learner, the on – the – job training is an inevitable part of the learning process. The different steps to be followed while arranging an on – the – job training program are listed below:

(i) Identify the areas of the subject in which training is required.

(ii) Identify the centres for OJT

(iii) Intiate necessary communication to get the sanction for OJT

(iv) Visit the centre and get details about the nature and method of training offerred

(v) Sign a memmorandum – of – understanding (MOU) with the centre

(vi) Prepare a time shedule for conducting OJT

(vii) Prepare an estimate for the program

(viii) Conduct the OJT program

(ix) Maintain the work dairy and other relevent records.

(x) Prepare a consolidated report.

(xi) Present the report in the class.

(xii) Provide the necessary suggestions and reccomendations during the conclusion.

11. Other Activities

Apart from the stratagies listed above the teacher is free to adopt any other method or activit that seems to create better awareness of the topic. The only thing is that the activities should be interesting, humuorous lively, of participative nature and should of course carry the essence of the concept or idea to be conceived. Collection of samples, preparation of charts observation of existing models, construction of a new models....etc.

Monitoring

Monitoring cells or committees should be framed to observe the progress of the learning process and evaluate it using suitable indicators. They should acess the progress, rectify the faults and put forward suggestions and recommendations from time – to – time. The monitoring should be carried out at least at three levels.

School Level

Region Level

State Level

PLANNING

In the context of changing scenario in the field of education, the role of teacher as well as the role of learner has changed. The emerging needs of education evolved the role of teacher as a facilitator. The learning process has been learner centered and activity oriented. Learning activities must enable the child to develop process domain and multiple intelligence skill to its maximum extent. No matter whether these skills are attained inside or outside the classroom, the teacher must be in mind that they are to be accomplished in time. In order to achieve this the teacher must take necessary plans. The plan must be structured as

Year plan, covering the entire activities for the whole year.

Term plan, covering the activties for the prescribed term.

Unit plan which has to be prepared just before each unit.

Day to day plan to provide activities for a day learning.

TERM PLAN (THEORY)

STANDARD XI **MRRTV**

Term	Month	Unit No	Name of Unit	Curriculum Objectives	Hour	Total
I	June	I	Introduction to electronic	1.3.1 to 1.3.5	16	
	July	II	Test and measuring instruments	2.3.1 to 2.3.5	16	
	August	III	Electronic components and devices	3.3.1 to 3.3.8	16	
	September	IV	Special semiconductor devices	4.3.1 to 4.3.6	16	
II	October	IV	Special semiconductor devices	4.3.7 to 4.3.8 &	16	64
		V	DC Power Supplies	5.3.1 to 5.3.7		
	November	VI	Amplifiers	6.3.1 to 6.3.7	16	
	December	VII	Oscillators	7.3.1 to 7.3.5	16	48
		VIII	Switching and waveshaping circuits	8.3.1 to 8.3.5	16	
III	January	VIII	Switching and waveshaping circuits	8.3.6 to 8.3.7		
		IX	Integrated circuits and digital technology	9.3.1 to 9.3.10	16	
	February	IX	Integrated circuits and digital technology	9.3.11 to 9.3.12		
		X	Audio Engineering	10.3.1 to 10.3.6	16	48
	March	X	Audio Engineering	10.3.7 to 10.3.6		160

TERM PLAN (PRACTICAL)

STANDARD XI **MRRTV**

Term	Month	Unit No	Name of Unit	Curriculum Objectives	Hour	Total
I	June	I	Symbols	-	52	
	July	I	Symbols (Contn..) Soldering Practice	-	52	
	August	I	Soldering (Contn..), PCB, Extension Board	-	52	
	September	II	OHM's Law, Krichoff's Law, Multimeters	1.3.2, 2.3.1, 2.3.3	52	208
II	October	II, III	CRO, Diode Characteristics	2.3.5, 3.3.7	52	
	November	III, IV, V	Zener Regulator, Rectifiers (3 nos) D.C Power supply	5.3.1 to 5.3.7		
	December	VI, VII	Amplifiers, Oscillators	6.3.1 to 6.3.7	52	156
III	January	VIII	Multivibrator, Integrator, Differentiator, Clipper, Clamper	7.3.1 to 7.3.5	52	48
	February	IX	Digital ICs, Flip-flop	9.3.1, 9.3.4, 9.3.8	52	
	March	X	D/A converter, Revision	9.3.10	52	156
						520

UNIT PLAN

Curriculum Objectives	Activities	Learning materials	Evaluation						
			CT	Project	Assignment	Seminar	Practical	Group Discussion	Period
1.To create interest in electronics and its various applications. Also to highlight the relevance of electronics in modern communication systems through surveys and field visitss.	Discussions, survey, chart preparation visual display, assignments.	Audio visual aids, pictures and charts, magazines	✓		✓			✓	15
2 To brush up the knowledge of the basic terms (voltage, current, power) and theorems (Ohm's law, Kirchaff's law) connected with electronics with the help of group discussions and analysis.	Discussions, experiments, observation, calculation, verfiication	PCB/bread board, resistors energy-sources, voltmeter, Ammeter, soldering iron solder, connecting wires, transformer, PA system.	✓				✓	✓	10
3 To develop a clear idea about r.m.s value and average values through observations and discussions.	Discussions, Obsevations	Charts, audio visual aids, Signal generator	✓				✓	✓	3
4 To familiarize the students with various d.c and a.c voltage sources hroguh demonstrations and collection of samples.	Discussions, Survey, Demonstration	CRO, multimeter, DC source, AC source, function generator	✓				✓	✓	3
5 To understand and anlayse the graph of d.c and a.c by preparing charts and other activities.	Discussions, Charts	CRO, AC and DC power supplies, Signal generator	✓				✓	✓	1

DAILY PLAN

Class : XI

Subject : **MAINTENANCE AND REPAIRS OF RADIO AND TELEVISION**

Unit : **Introduction to Electronics**

C.O. :
- To give students an idea about voltage sources
- To enable students: to name a few sources of electrical energy and
- To draw the symbols of ideal and practical voltage sources

Equipment required : Voltage sources like, Battery, Generator, Alternator

Process/Activities	Evaluation
• The students are asked to name different types of voltage sources. • The students are asked to observe the working of ac & dc voltage, then they are asked to note down the differences observed in their working. • For observing the above activity lab visit is required. • Students are asked to point out the difference observed by them in the working of a practical voltage source from that of an ideal source.	.....

EVALUATION

Introduction

As the curriculum is based on a particular vocation, evaluation becomes an inevitable procedure. Evaluation is done along with learning process throughout the course of study. Inorder to make an evaluation, the teacher should be able to understand the students, their scholastic and co-scholastic knowledge. Capacity building in the selected vocation is the most important part in vocational education and it should be evaluated accordingly. The technical skills, interest and devotion in the particular field, communication skills, analysis, organising and presentation skills etc. have to be evaluated. The personal and social qualities also have to be evaluated. Thus evaluation is an integral part of learning process which assesses the implementation of the curriculum.

Need and importance of Evaluation

Evaluation is to assess the scientific knowledge of students and to recognise to what extent they have achieved the specified capabilities. A written examination at the end of an year which is purely based on a textbook is not of much use. "Evaluation is a systematic process of collecting, analysing and interpreting evidence of students' progress and achievement both in cognitive and non-cognitive areas of learning for the puprose of taking a variety of discussions".

The teacher can properly assess the level of the learner and can identify his/her strength and weakness. This will help each student to evaluate themselves and to improve their level of learning by taking necessary assistance from the teacher(self evaluation)classmates can evaluate themselves through interaction (peer group evaluation)Evaluation even help the teacher to analyse and improve their performance. Evaluation helps to integrate the teacher, learner and even the parents. Thus student who are socially useful and can perform productive work are created. This will improve the quality of our young generation.

Features of Evaluation

- Evaluation should be humane in nature. It must help the students grow as social beings.
- Evaluation should be the responsibility of the teacher who teaches the students and is responsible for developing the requisites healthy attributes in them.
- Evaluation should be consistent with its purpose and must provide a reliable and valied measure of the student's performance.

- Evaluation should reflect the outcome of each learning intervention and should provide all the students with equal oppurtunity to display their individual potential.
- Evaluation should take into account both the background and the prior experience of the students.
- Procedures for grading and their reporting should be appropriate and easily understood by one and all.
- Evaluation should restore the faith and trust of the massess by ensuring transparency in the procedure.

Theories of constructivism and multiple intelligence are the basis of modern learning. So evaluation strategies have also to be changed. Evaluation must be;

- Continuous and comprehensive
- Scholastic and co-scholastic
- Depending on grading system.
- Depending on a vocational or trade proficiency.

Continuous and Comprehensive Evaluation

Most of our traditional evaluation methods are related only to the area of scientific knowledge or the memory of students. To eliminate the limitations of this method we are forced to evaluate the multi-dimensional competencies of the learner with respect to the practicability and nature of the subject.

Continuous and Comprehensive Evaluation is an essential ingredient of any learning process. It helps the learner to understand and evaluate his own progress and to develop adequate strategy for furthur improvement. Continuous Evalution also helps us to measure the attained goals of formulated curriculum objectives.

Merits of Continuous and Comprehensive Evaluation system are:

1. Making student's learning regular
2. Provides for a variety of activities
3. Effective feedback is possible
4. Assess the allround development of the learner on a continuous basis through a variety of activities.
5. Remedial and diagnostic teaching is possible.
6. The process as well as the product is assessed.

Different tools are used to evaluate the multi diamensional competencies of the learners. The Continuous and Comprehensive Evaluation (CCE) includes not only written test (class tests) but also oral tests, observation, interview, debates, discussions, seminars etc.

The learner proceeds through a variety of learning experiences. Therefore the level of progress should be evaluated in a comprehensive and continuous manner. More over, the learner is to be made aware of the findings and it helps him to measure his progress. Necessary help should be provided to them in time. As such we can generate the environment and opportunity for Continuous Evaluation.

In order to evaluate the multi- dimensional competencies of the learner, different tools and techniques have to be used. The multi- dimensional competencies of the learner include :

- Class -room interaction
- Task orientation
- Creative expression
- Field/institutional interactions
- Knowledge assessment/ expression

Continuous Evaluation Items

1. Assignment
2. Seminar
3. Class test
4. Project etc.

* For continuous evaluation class test (CT) is made compulsory taking any two of the above said indicators. CT can be a written test, oral test (viva), Practical test.

CE Item	Evaluation Indicators	Weightage	Score
1. Assignment	1. Awareness of the content	4/3/2/1	
	2. Comprehensiveness of the content	4/3/2/1	
	3. Systematic and sequential arrangement	4/3/2/1	
	4. Observation/suggestions/Views Judgements/ Evaluation	4/3/2/1	
	5. Timely Submission	4/3/2/1	20
2. Seminar	1. Ability to plan and organise	4/3/2/1	
	2. Skills in the collection of data	4/3/2/1	
	3. Awareness of the content (presentation of the paper, participation in discussion, ability to substantiate the ideas and views)	4/3/2/1	

	4. Ability to prepare the report (sequence in the presentaionof the concepts, authenticity and clarity of ideas/views/concepts	4/3/2/1	
	5. Quality of Seminar Document	4/3/2/1	20
3. Project	1. Ability to plan (Selection of the method for solution of the problem, identifying suitable tools, planning the various activities to be carried out in each stage)	4/3/2/1	
	2. Ability to collect data (sufficiency and Relevance of data. Classification and arrangement of data for analysis, reliability and authenticity of the Collected data.)	4/3/2/1	
	3. Ability to analyse the elements and procedure (Structuring of elements and developing logic. Efficieny in using the package/tool. Recognising design errors and correcting them)	4/3/2/1	
	4. Ability to prepare the project report (Reflection of the process skills. Communicability and authenticity of the report in relation with the Project diary	4/3/2/1	
	5. Viva Voce(Knowledge of the content and Process)	4/3/2/1	20

CE item calculation

Subject **item: Assignment**

Sl. No	Name	Evaluation Indicators					Total Score (20)
		I (4)	II (4)	III (4)	IV (4)	V (4)	
1	Anand	2	3	4	4	4	17
2	Shibu	4	3	4	4	4	19

Total CE calculation

Sl. No	Name	CE Items			Total (60)	Total CE Out of 20
		1 Class Test (20)	2 Assigment (20)	3 Seminar/ Project (20)		
1	Anand	18	17	19	54	18
2	Shibu	20	19	18	57	19

Grading for CE

Each item in CE is evaluated giving its required score and graded as shown. 5 point grading is given

17 → 20 → A grade

13 → 16 → B grade

9 → 12 → C grade

5 → 8 → D grade

≤ 4 → E grade

Terminal Evaluation (TE)

Terminal Evaluation is in written form. The test should not be aimed to test the memory alone. The terminal evaluation questions give more emphasis on application level, analysis and synthesis. The questions are framed so that the students are able to apply their different mental process. The maximum score is 80 and the minimum score of TE is 24 (30%).

The terminal evaluation questionnaire should be capable of measuring

- Content validity
- Criterion validity
- Constant validity
- Reliability
- Class test, term evaluation and annual examination should be in tune with the new approach.
- Should not be prepared to test the rote memory.
- Questions asked should provoke the thinking abilities of students.

- Questions to test the competency of application analysis, synthesis and evaluation are to be given. In otherwords the questions should be framed in such a way that the students are able to apply their various mental processes.
- Questions should be based on the learning process and the new approach to each subject.
- Results should be scientifically analysed.
- Evaluation results should be analysed and follow up may be carried out at relevant levels (remedial measures).
- Eighty percent marks are set apart for the common examination as the part of the Term Evaluation

The Question Paper must have

- Application level questions
- Synthesis level questions
- Comparison of facts
- Challenging questions
- Scope for obtaining innovative ideas
- Giving creative thinking by the students
- Questions based on the objectives of learning activities
- Practial oriented questions
- Enviornment related questions
- Divergent thinking level questions

Role of the Teacher in the Evaluation Process

- Preparation for the effective execution of evaluation
- Preparation of daily planning notes (teaching manual) and helping learners in their activities.
- While learners are engaged in doing seminars/collections/assignments/ collections, conduct interim evaluation and provide necessary help.
- Consider assignment, seminar, collections etc. as learning activities and approach them as evaluation materials.
- Prepare a format to record continuous evaluation.
- Identify and evaluate the progress at different stage.
- Find out learner's difficulty by conducting feedback.
- Make use of the support mechanism fully, provided by the department of education.

- Make the parents aware of the new approach to curriculum and evaluation system through class P.T.A.
- Make use of the training programme for professional excellence and transparency in work.
- Make use of the Humanities Teachers Council for academic progress.
- Identify and make use of the possibility of action research to resolve classroom learning problems.

Grading

It is not scientific to assess the achievement of a student soley based in the marks in the terminal examinations. Marking system proved unscientific in evaluating the growth and development of students both in cognitive and non-cognitive areas. To overcome this shortcomings, a popular mode of evaluation based on students' performance- grading system- has been evolved. At the Higher Secondary stage, it is desirable to use a point absolute grading to co-ordinate and record the evaluation. After giving the score, they are changed into percentages and appropriate letter grades are awarded curresponding to each percentage. The score percentage and curresponding letter grade in Political Science is given below.

Subject Consolidation

Sl. No	Name	CE (20)	TE (80)	Total CE+ TE (100)	Grade

The maximum score of CE + TE is 100 and the minimum score is 30(30%)

Practical Evaluation (PE)

PE is the important part of vocational practicals. The practical skills must be evaluated after completing all practical experiments in each term and at the end of the academic year. PE must cover all required indicators to evaluate the technical skill and practical knowledge of the different topics covered.

Vocational Practical Evaluation Indicators (MRRTV)

1.	Identification of objective & requirement	:	20%
	a. Circuit		
	b. Materials & Tools required		
2.	Procedure & precautions	:	10%
3.	Working skill & handling of tools	:	30%
4.	Output	:	10%
5.	Record (Diary)	:	10%
6.	Viva	:	20%

Vocational Competency Evaluation

Being a vocational course, a system to judiciously evaluate the required value addition and consequent capacity building in the selected vocational subject is highly essential. As the other evaluation components like CE, PE and TE cannot assess the vocational competencies and professional skills acquired by the students, an internship evaluation (IE) component has been introduced to meet this requirement.

Internship evaluation should be done based on the following components.

I. Regularity and punctuality.

A regular presence and habit of time bound completion of task is a must for attaining maximum efficiency.

Regularity and Punctuality can be evaluated by 5 point scale.

Rating scale

		1	2	3	4	5
1	Regularity	Never regular	Often regular	Usually regular	Most of the time regular	Always regular
2	Punctuality	Never Punctual	Often Punctual	Usually Punctual	Most of the time PunctualPunctual	Always

Regularity and punctuality can be assessed by using attendence of the student and time bound completion of tasks.

II. Value addition

Value addition can be evaluated through conducting field visits/survey. The experiences gained through field visit and survey increases the level of intrinsic motivation and positive attitude towards the vocational field and there by increase his value as a skilled semi- professional.

The aim of value addition is to measure the interest, devotion Group managment, persevernce of the learner in specific areas Value addition can be evaluated from field visit, survey and simulated experiments.

III. Capacity building

Capacity building can be evaluated through conducting the following activities.

1. OJT/Simulated experiment
2. Performance- Camp/ Exhibition/ Clinic.
3. Performance- Production/Service cum Training centre.

These components helps the students to practice the acquired skills in the real situation and there by increasing self confidence and promoting self reliance.

Capacity building is aimed at measuring the skills of the learner from OJT/ production cum training centre/ research and development/graded area exposure.

IE Item	Evaluation Indicators	Weightage	Score
1. Regularity and Punctuality			10
2. Value addition	**Field Visit** 1. Attitude and readiness towards the task. 2. Capacity for observation. 3. Data collection. 4. Application of ideas. 5. Documentation / recording. OR **Survey** 1. Planning. 2. Data collection. 3. Consolidation of data and analysis. 4. Drawing inference. 5. Reporting.	 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1	20
3. Capacity building	**OJT/ Simulated Experiment/ Practical skill** 1. Involvement / Participation. 2. Skills in doing work / Communication skill. 3. Time bound action. 4. Capacity for observation, analysis and innovation. 5. Documentation, Recording and display. OR **Performance in camp/ Exhibition/ clinic** 1. Ability for planning and organising. 2. Mastery of subject. 3. Ability for communication.	 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1	20

IE Item	Evaluation Indicators	Weightage	Score
	4. Innovation.	4/3/2/1	
	5. Involvement/Social commitment.	4/3/2/1	
	OR		
	Performace in production/ service cum training centre (PSCTC)		
	1. Mastery of vocational skills.	4/3/2/1	
	2. Managerial capacity.	4/3/2/1	
	3. Promoting self confidence.	4/3/2/1	
	4. Innovative approach.	4/3/2/1	
	5. Promoting self - reliance.	4/3/2/1	

Vocational Competency Items for Internship Evaluation

Items	Score
Regularity & Punctuality	10
Field visit/survey(any one)	20
OJT/simulated experiment/ Practical Skill/ Performance-Camp/exhibition/Clinic Performance- PSCTC (any one)	20
Total	50

A minimum of 80% attendence is required for promotion to the second year. Those who have shortage of attendence should repeat first year. Those who have 80% and above attendence but failed to achieve 30% of Internship Evaluation (IE) will be promoted to the second year. He has to improve the component in which he performed poor. He has to attain the minimum by improving the particular component to get eligible for appearing second year public examination.

Format for Subject Wise Evaluation

Sl. No.	Name	CCE					TE (80)	Total (100)	Grade	PE								Vocational Competency Evaluation				
		1 (20) Class Test	2 (20) Assign-ment	3 (20) Semi-nar/ Project	To-tal (60)	Total out of 20				1	2	3	4	5	6	To-tal	Grade	Regularity and Punctual-ity (10)	Value Addition (20)	Capacity building (20)	Total (50)	Grade

Format for School wise Score Sheet

Sl no:	Name	English				General Foundation Course				Vocational Subjects								Physics					Chemistry					Mathematics			
										CE	TE			PE		VCE															
		CE	TE	Total	Grade	CE	TE	Total	Grade	CE	TE	Total	Grade	Total	Grade	Total	Grade	CE	TE	PE	Total	Grade	CE	TE	PE	Total	Grade	CE	TE	Total	Grade

Government of Kerala

Board of Vocational Higher Secondary Examinations

Thiruvananthapuram

Reg: No.

Dated : _ _ _ _ _ _ _

Evaluation Sheet

Sri./Smt. _ is awarded Scores/grade as detailed below in the First Year Vocational Higher Secondary Examination held in _

Name of School : _ _ _ _ _ _ _ _ Admission No : _ _ _ _ _

Name of Vocational Course : _ _ _ _ _ _ _ _

Subject	Score Obtained					Positional Grade	Grade in words
	CE 20	TE 80	PE 150	IE 50	Total		
Part- I							
English			_	_			
General Foundation Course			_	_			
Part- II Vocational Subjects							
Vocational Theory			_	_			
Vocational Practical	_	_		_			
Vocational Competency	_	_	_				
Part- III Optional Subjects							
	20	**60**	**20**				
Physics				_			
Chemistry				_			
	20	**80**					
Mathematics			_	_			

CE- Continuous Evaluation, TE- Term End Evaluation, PE- Practical Evaluation, IE- Internship Evaluation.

Grades	**A+**	90% and Above Outstanding	**A**	80- 89%	Excellent.
	B+	70 - 79% Very Good	**B**	60- 69%	Good
	C+	50 - 59% Above Average	**C**	40- 49%	Average
	D+	30 - 39% Marginal	**D**	20- 29%	Need improvement
	E	Below 20% Need improvement			

Marks Entered by _ _ _ _ _ _ _ _ _

Marks checked by _ _ _ _ _ _ _ _ _ SECRETARY

Supdt/ T. O _ _ _ _ _ _ _ _ _

SYLLABUS

1 Introduction to electronics

What is electronics, brief overview of the fields and applications. Role of electronics in modern communication systems, Important terms : Current, voltage, power, d.c and a.c voltage sources, graphical representation of d.c and a.c. Phase, frequency, RMS value, Average value. Basic Theorems : Ohm's law, Kirchoff's laws, Maximum Power Transfer Theorem.

2 Test and measuring instruments

Testing instruments - Familiarisation and use of analog and digital multimeters. Familiarisation and use of AF/RF signal generators and function generators. Familiarisation and use of cathode-ray-oscilloscope. (Block diagram, working principle)

3 Electronic components and devices

Active and passive components: Resistors, Capacitors and Inductors Transformers and Relays, RLC circuits - Reactance, Impedance and Resonance. Semi conductor devices : PN junction diodes, bipolar transistor.

4 Special semiconductor devices

Special devices: Zener diode, varactor diode, Tunnel diode, PIN diode, Schottky diode, Gunn diode, IMPATT diode, TRAPPAT diode, FET, MOSFET, UJT, SCR, DIAC, TRIAC, VDR, LDR, Thermistor, Opto-electronic Devices : LED, Infrared LED, LCD, Photodiode Phototransistor, Opto Coupler, Opto isolator, CCD, Solar cell, SMD, LASSER Diode, Seven-segment displays, Optical fibre cables.

5. DC Power supplies

D.C. Power supplies : Rectifier, Filters, Zener Voltage Regulator, Regulated d.c. power supply, Dual power supply, SMPS.

6. Amplifiers

Amplifying action of a transistor - Basic Principle. Single stage and multistage amplifiers - voltage amplifiers and power amplifiers- direct coupled, RC coupled and Transformer coupled amplifiers - Class A, Class B and Class C amplifiers Tuned amplifiers - Feedback amplifiers.

7. Oscillators

Transistor Oscillator - need for feedback. Hartley Oscillator, Collpitt's Oscillator, RC Phase shift Oscillator and Crystal Oscillator.

8. Switching and waveshaping circuits

Multivibrator - Astable, Monostable and Bistable multivibrators, Schmitt trigger, Differentiator, Integrator, Clipper (positive, negative, biased) and Clamper circuits (positive and negative type).

9. Integrated circuits and digital technology

Basic concept of ICs. Merits and limitations of ICs. Important fields of applications, Scale of integration - SSI, MSI, LSI and VLSI ULSI. Pin identification of ICs, Types of ICs - Analog and digital (comparison only). Familiarisation of analog ICs (IC-555 and IC 741 IC 78XX series and 79XX series). Introduction to digital ICs - Types - CMOS and TTL. 74XX series (introduction only).

Digital Electronics - Introduction to binary number system. Concept of bit and byte. Introduction to logic gates - OR, AND, NOR, NAND, NOT, X-OR - symbols and truth tables. Introduction to flip-flops- JK, SR, T, D (Basic treatment only) Introduction to shiftregisters and digital counters (Fundamentals only) Analog-to-Digital (A/D) converters and digital-to analog (D/A) converters (Introduction only). Multiplexers and demultiplexers (introduction only) and Modems. (Basic treatment only).

10. Audio Engineering

Characteristics of sound – Amplitude, frequency, phase, wavelength; Moving Coil microphone – Principle, Construction, Working and Applications; Ribbon, Crystal, Carbon Condenser, Electret, Tie-clip, Wireless (FM) Microphones- Familiarization and uses only (Details not necessary), Moving Coil loudspeaker- Principle, Construction, Working and Applications, Electrodynamic and Horn type loudspeaker- Familiarization and use only; Baffles, Enclosures, Tweeters, Woofers, Squakers and Cross-over networks. (Basic concept only)., Magnetic Recording and reproduction- Basic principle only; Optical Recording and reproduction- Basic principle only.

CURRICULUM OBJECTIVES

1 Introduction to electronics

- To create interest in electronics and its various applications. Also to highlight the relevance of electronics in modern communication systems through surveys and field visits.
- To brush up the knowledge of the basic terms (voltage, current, power) and theorems (Ohm's law, Kirchoff's law) connected with electronics with the help of group discussions and analysis.
- To develop a clear idea about r.m.s value and average values through observations and discussions.
- To familiarize the students with various d.c and a.c voltage sources through demonstrations and collection of samples.
- To understand and analyse the graph of d.c and a.c by preparing charts and other activities.

2 Test and measuring instruments

- To familiarize the students with the use of analog multimedia for the measurement of d.c and a.c voltages and currents through demonstration, observation and direct practical experience in the laboratory.
- To develop the skill in students to use the multimeter for testing different components through demonstration and hands-on experience in the laboratory.
- To enhance the skill of the students in using a digital multimeter for testing and measurement through demonstration observations and direct practical work experience.
- To introduce the AF/RF signal generators and function generators to the students through demonstrations and enable them to familiarise with its applications through direct experience and observations in the laboratory.
- To introduce the basic working principle of a CRO with the help of a block diagram and demonstration. Also to familiarise them with different applications of the CRO (voltage measurement, frequency measurement, display of waveforms) through demonstrations and follow-up practical work in the laboratory.

3 Electronic components and devices

- To identify various electronic components and classify them through demonstrations, surveys and collection.
- To read the values of resistors and capacitors from their code marks through practical experience in the lab.
- To familiarise the students with the testing of resistors, capacitors, inductors through surveys, collection, field visits and seminars. Also to identify the faults from the symptoms.
- To understand the construction, working and testing of transforms through hands on experience in the lab.
- To introduce the concept of inductive reactance, capacitive reactance, impedance and series and parallel resonance, through seminars, group discussion and direct practical experience in the lab.
- To familiarise the students with various types of relays and their important applications with the help of field visits and observations.
- To familiarise the students with different semiconductor diodes their biasing and volt - ampere characteristics through collection surveys, observations and practical work in the lab.
- To familiarise the students with bipolar transistors, their configurations (CB, CE and CC) and amplifying action through direct practical work in the lab.

4 Special semiconductor devices

- To understand the working principle and characteristics of a zener diode and familiarise with its applications through demonstration and hands on work in the laboratory.
- To identify a varactor diode, tunnel diode, PIN diode, schottky diode, Gunn diode, IMPATT diode, TRAPATT diode and familiarise with their uses through collections, laboratory demonstration, observatory surveys and field visits.
- To understand the basic principle of a FET and familiarise with its applications through discussion, seminars and demonstrations.
- To identify the MOSFET, UJT, SCR, DIAC, TRIAC, VDR, LDR, Thermistor through demonstration, collection, surveys, charts and field visits.
- To introduce certain optoelectronic devices such as LED, Infrared LED, LCD, Photodiode, Phototransistor, Optocoupler, CCD, Solar cell seven-segment displays etc. and enable the students to get familiar with these components and their uses thorugh demonstrations, collections, surveys, field visits and expert seminars.
- To familiarise the students with the latest developments in component technology such as Surface Mount Devices (SMD) through field visits, surveys and expert seminars.

- To enable the students to get familiar with optical fibres through demonstrations and field visits.
- To introduce the concept of laser diode through seminars, demonstration and field visits.

5. DC Power Supplies

- To enable the students to identify various stages in a d.c powersupply through demonstration, general discussions, preparation of charts.
- To brush up the idea about half-wave, fullwave rectifiers through group discussions and practical assignments.
- To understand the working of capacitor filter; choke-input filter and pi(p) filter circuits through demonstration, seminar and observation of waveform on the CRO.
- To familiarise with the working and application of a zener voltage regulator through discussions, class-room transaction and practical work in the lab.
- To introduce the concept of a dual power supply through class-room transaction **and demonstration.**
- **To introduce the principle and working of SMPS through demonstration and discussion.**
- **To create an awareness about the merits and applications of a SMPS through debates and surveys.**

6 Amplifiers

- To refresh the knowledge about the amplifying action of a transistor through seminars and discussions.
- To understand the idea of single stage transistor amplifier circuit through demonstration, observation of wave forms and familiarize with its working through practical work in the lab.
- To understand the difference between a voltage amplifier and a power amplifier through discussion, debate and preparation of charts.
- To familiarise different types of multistage amplifier circuits-direct coupled, RC coupled and transformer coupled - through displays, demonstration observations and practical work.
- To introduce the concept of Class A, Class B (push-pull) and Class C amplifiers and their circuits through class-room transaction, demonstration, displays and practical work.
- To introduce the concept of tuned amplifier through demonstration and observations.
- To introduce the concept of feed back in amplifiers and their circuits through demonstration and observation.

7 Oscillators

- To create a basic understanding of a transistor oscillator and to aware them about the need for feed back through discussion and demonstration.
- To introduce the circuit of a Hartley Oscillator and to familiarise with its working through demonstration and practical work in the lab.
- To familiarise with the Collipitts Oscillator circuit through demonstration, observation and practical work.
- To understand the basic principle of a RC phase shift oscillator and familiarize with its circuit through demonstration, observation and practical work in the lab.
- To familiarize with the working of a crystal oscillator through demonstration and observation.

8 Switching and waveshaping circuits

- To understand the working of a transistor astable multivibrator circuit through observation and familiarize with the circuit through practical work.
- To understand the basic concept of monostable multivibrator by observation and familiarize with it through demonstration.
- To understand the working of bistable multivibrator by observation.
- To introduce the schmitt trigger and familiarize with the circuit through observation.
- To familiarize the differentiator and integrator circuits through observations and practical work.
- To familiarize various clipper circuits (positive, negative and biased) through observation and practical work.
- To familiarize various clamper circuits (positive, negative) through observation and experimentation.

9. Integrated circuits and digital technology

- To introduce the basic concept of ICs and familiarization of different types and their applications through class room transaction, demonstrations and observatory surveys.
- To create an awareness about merits and limitations of ICs through group discussions or debate.
- To introduce the scale of integration in ICs (SSI, MSI, LSI, VLSI and ULSI) through classroom transaction and charts.
- To enable the students to identify the pin configuration of ICs (741 and 555, 78XX, 79XX) only through demonstration, display observations, preparation of charts and simple practical work in the lab.
- To introduce the different types of digital ICs (CMOS and TTL) and their applications through charts, demonstrations and surveys.

- To introduce the concept of binary number system, bit and byte through class room presentation, discussion, games and other interesting activities.
- To introduce the concept of logic gates (OR, AND, NOR, NAND, NOT, X-OR) through class room transaction, preparation of charts, games, etc. and enable them to get familiarized with their truth-tables through interesting practical activites in the lab.
- To introduce the concept of flip-flops (basic treatment) through discussion, charts and games.
- To introduce shift registers and counters through discussions, charts, display, demonstration or even games.
- To introduce the basic concept of A/D and D/A converters through discussion, charts and displays and to familiarise them with their application through observations and surveys.
- To familiarize them with the basic idea of multiplexers and demultiplexers and their applications through displays, charts, demonstrations or games.
- To introduce the basic concept of modems through class room presentation, demonstration or displays or charts. To familiarise with its applications through surveys, field visits and assignments.

10 Audio Engineering

- To create a basic idea regarding the important characteristics of sound such as amplitude, frequency, phase and wave length through class-room transaction and discussion.
- To familiarize the students with the construction, principle, working and applications of a moving coil microphone through discussion, demonstration and displays.
- To enable the students identify different types of microphones- ribbon, crystal, carbon, condenser, electret, tie-clip, and wireless (FM) types- and familiarize them with their important applications through demonstration, charts, displays, surveys and assignments.
- To introduce the basic principle of a moving coil loudspeaker and familiarize them with its construction, working and applications through class-room transaction, demonstration displays and discussions.
- To familiarize the students with electrodynamic and horn type loudspeakers through discussion, demonstration displays, charts and surveys.
- To introduce the basic idea of baffles, enclosures, tweeters, woofers, squakers and cross-over networks through discussions, seminars, demonstrations, surveys, displays, charts...etc.
- To introduce the basic concept of magnetic recording of sound with the help of classroom transaction, discussion, displays and charts.
- To introduce the basic concept of optical recording of sound on a disc through classroom transaction, discussion, displays and charts.

Part II

Unit Wise Analysis

1 INTRODUCTION TO ELECTRONICS

1.1 Introduction

The everwhelming quest for knowledge and comfort has led the modern man from the age of stones to the era of information technology. Flying on the wings of science, he is setting newer heights in the search for both living conditions. Now in this millennium, he finds the most suited weapon in electronics to conquer the most menacing challenges in daily life. In this scenario, the learning of electronics and its applications is so significant and relevant to become a member of this forth coming generation and to earn the livelihood from it.

This unit is so designed as to create a general awareness of the field of electronics and its various practical applications. The most important forms and theorems in electronics are mentioned to brush up the knowledge of the students which they have acquired from their earlier classes. Teacher should adopt different strategies such as demonstration or discussion to evoke the maximum interest of the learners.

1.2 Syllabus

What is electronics, brief overview of the fields and applications. Role of electronics in modern communication system, important terms : Current, voltage, power, dc. and a.c voltage sources, graphical representation of d.c and a.c. Phase, frequency, RMS value, Average value .. etc. Basic Theorems : Ohm's law, Kirchoff's laws, Maximum Power Transfer Theorem.

1.3 Curriculum Objectives

1.3.1 To create interest in electronics and its various applications. Also to highlight the relevance of electronics in modern communication systems through surveys and field visits.

1.3.2 To brush up the knowledge of the basic terms (voltage, current, power) and theorems (Ohm's law, Kirchoff's law) connected with electronics with the help of group discussion and analysis.

1.3.3 To develop a clear idea about r.m.s value and average values through observations and discussions.

1.3.4 To familiarize the students with various d.c and a.c voltage sources through demonstrations and collection of samples.

1.3.5 To understand and analyse the graph of d.c and a.c by preparing charts and other activities.

1.4 Points to be highlighted

- What is electronics?
- Applications of electronics in various fields
- What is voltage, current and power?
- Relation between voltage and current
- Properties of electronics
- Differences between d.c. and a.c
- Examples for d.c and a.c voltage sources
- Amplitude, Time period, Frequency, phase, Peak-to-peak values .... etc.
- RMS value and Average value
- Ohmic conductors and non-Ohmic conductors
- Open circuit, closed circuit, circuit junction etc.
- Source, Load

1.5 Learning Activities

1.5.1 The teacher should give a general presentation of the various applications of electronics in present life. Then divide the students into small groups of 4 or 5 each. Then each group should be asked to prepare a list of various electronic appliances they happened to see or handle. One of the members of each group should read the list prepared by them in the class. The teacher should finally consolidate these lists and prepare a chart by classifying the instruments depending upon the nature of applications, i.e. audio, video, control,... etc. Then the teacher should give a brief-up with more emphasis on instruments used for communication.

1.5.2 *Group Discussion* : The students are divided into small groups and are directed to discuss and convey their ideas about voltage, current and power from their knowledge of previous classes. They should also prepare a report which is to be collected. Going through the reports, the teacher should effectively brief up and rectify the incorrect aspects if any. Also each group should be given questions based on application level and ask to find the answer through discussion within the group.

1.5.3 Demonstration of wave forms on the CRO: The students are directed to go through their previous year's textbook on physics and brush up their knowledge of d.c and a.c voltage and current. Then the teacher should introduce different waveforms and give a live demonstration with the help of a signal generator and CRO. The variations in different parameters such as amplitude and frequency must be illustrated and the knob control used for that must be explained. Then the students may be directed to monitor waveforms on the CRO screen with the help of a signal generator. The performance of the students may be evaluated using grading indicator for laboratory work.

1.5.4 Divide the students into two groups. Then the groups are asked to conduct a survey about different types of d.c and a.c voltage sources, used in their homes, laboratories, service centres or industrial units. Finally one of the groups should be asked to prepare a list of d.c. sources and a chart showing the pictures and diagrams along with the basic working principles.

1.5.5 The students are given individual assignments to prepare a chart showing different types of wave form (sine, square, saw-tooth, etc) with different amplitude, frequencies and wave forms. Some of the members may be asked to present the chart before the class and conduct a seminar on waveform parameters and types. Finally the teacher should brief-up with an introduction of complex waveforms.

1.6 Practicals-Laboratory work

Activity 1.5.3

1.7 Surveys, Collection of data, preparation of chart

Activity 1.5.1

Activity 1.5.4

Activity 1.5.5

1.8 Item for Continuous Evaluation

Activity 1.5.3

Activity 1.5.5

Reference

Basic Electronics and Linear Circuits - N.N.Bharghava

Principles of Electronics - V.K.Mehta

Electrical Engineering Technology - B.L.Thareja

UNIT ANALYSIS

1. INTRODUCTION TO ELECTRONICS

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To create interest in electronics and its various applications. Also to highlight the relevance of electronics in modern communication systems.	Definition of electronics, developments, applications and relevance of this field in present scenario	Concept development analysis and observation, survey	Discussions, survey, chart preparation visual display, assignments.	Audio visual aids, pictures and charts, magazines	Understanding of facts
2 To brush up the knowledge of the basic terms (voltage, current, power) and theorems (Ohm's law, Kirchaff's law) connected with electronics with the help of group discussions and analysis.	Ohm's law Kirchoff's laws (I=0, V=0) Maximum power transfer theorem	Discussions Experimentation Analysis	Discussions, experiments, observation, calcuation, verfiication	PCB/bread board, resistors energy-sources, voltmeter, Ammeter, soldering iron solder, connecting wires, transformer, PA system.	Concepts about current branching voltage drop across resistors, impedence matching.
3 To develop a clear idea about r.m.s value and average values through observations and discussions.	average vlaue r.m.s value	Difference between average and r.m.s value	Discussions, Obsevations	Charts, audio visual aids.	Understanding of facts
4 To familiarize the students with various d.c and a.c voltage sources	Familiarize with various types of voltage sources AC signals, DC signals	Seminar, Demonstration, Survey	Discussions, Survey, Demonstration	CRO, multimeter, DC source, AC source, function generator	Concepts about different parameters of ac waves. Graphical representaiton
5 To understand and anlayse the graph of d.c and a.c	Graphical representation of AC and DC	Plot graph, Preparation of chart	Discussions, Charts	CRO, AC and DC power supplies	Ability to plot graph

2 TEST AND MEASURING INSTRUMENTS

2.1 Introduction

Before going to the study of electronic components and circuits, it is necessary to have a clear idea about the basic principles of various instruments used for the testing and measuring of different components and their values. It is also important to acquire the necessary skills to use them precisely and most effectively. So this chapter is devoted for the study of some of the basic instruments which are most used for the test and measurement of circuit parameters. The range of instruments available now is enormous that all of them cannot be listed here in a single stretch. So the topic is confined to the study of multimeters, signal generators and CRO which are the most inevitable tools for an electronic technician.

2.2 Syllabus

Testing instruments - Familiarization and use of analog and digital multimeters. Familiarization and use of AF/RF signal generators and function generators. Familiarization and use of cathode-ray-oscilloscope.

2.3 Curriculum Objectives

2.3.1 To familiarize the students with the use of analog multimeter for the measurement of d.c and a.c voltages and currents through demonstration, observation and direct practical experience in the laboratory.

2.3.2 To develop the skill in students to use the multimeter for testing different components through demonstration and hands-on experience in the laboratory.

2.3.3 To enhance the skill of the students in using a digital multimeter for testing and measurement through demonstration observations and direct practical work experience.

2.3.4 To introduce the AF/PF signal generators and function generators to the students through demonstrations and enable them to famililiarise with its applications through direct experience and observations in the laboratory.

2.3.5 To introduce the basic working principle of a CRO with the help of a block diagram and demonstration. Also to familiarize them with different applications of the CRO (voltage measurement, frequency measurement, display of waveforms, through demonstrations and follow-up practical work in the laboratory.

2.4 Points to discuss :

- Basis working principle of analog multimeter.
- Basic working principle of a digital multimeter.
- Basic working principle of a signal generator
- Basic working principle of a CRO (block diagram)

2.5 Learning Activities

2.5.1 A seminar may be conducted by the students to brush up their knowledge of Voltmeters and Ammeters and finally the teacher should effectively sum-up how they are combined into a multimeter and should give a live demonstration of how to use the multimeter for the voltage and current measurements. Then the students may be asked to carry-out these measurements individually from a circuit arranged in the lab and their performances should be evaluated using grade indicators for the lab work.

2.5.2 The teacher should introduce the method of using an analog multimeter for testing various components followed by a demonstration session in the laboratory. Then the students are divided into small groups. Each group is then supplied with a few components and ask them to test the components and classify them as genuine or faulty. Also direct them to measure the values of resistors and compare the result with the given code. Then each group should be asked to prepare a chart from the available data

2.5.3 The teacher should give an introductory presentation of the digital multimeter and its applications. Then repeat the activity 2.5.2 using the digital multimedia.

2.5.4 Introduction the AF/RF signal generator and give a demonstration of using it for testing purpose. Then prepare a sample circuit (e.g.: amplifier) and ask the students to test it using the signal generator and a CRO or multimeter.

Assignment : Ask the students to prepare a chart showing the front-panel controls of the signal generator.

2.5.5 Introduce the function generator and demonstrate the different functional wave forms on a CRO screen. Then the activity 2.5.4 may be repeated using function generator.

2.5.6 Introduce the basic principle and important applications of the CRO. Then give a demonstration of displaying different waveforms from the function generator on the CRO screen. Also explain how to measure the different parameters using the CRO. Then divide the students into small groups and each group is asked to measure and record the parameter of different types of waveforms using the function generator and CRO.

Assignment : Ask the students to prepare a chart showing front panel control of a CRO.

2.5.7 The students are divided into small groups and asked to conduct a survey of various test and measuring instruments used in the nearby service centres and industrial units. At the end each group should submit a report. The teacher should consolidate the reports and prepare a chart showing various instruments used for test and measurement.

2.5.8 A group discussion may be conducted about different instruments used for test and measurement in electronic circuits.

2.6 Practical Laboratory work

Activity 2.5.1

Activity 2.5.2

Activity 2.5.3

Activity 2.5.4

Activity 2.5.5

Activity 2.5.6

2.7 Seminar or Assignment or Group Discussion

Activity 2.5.1

Activity 2.5.4

Activity 2.5.5

Activity 2.5.6

Activity 2.5.8

2.8 Field visit or survey

Activity 2.5.7

2.9 Item for Continuous Evaluation

Activity 2.5.2

Activity 2.5.3

Activity 2.5.4

Activity 2.5.5

Activity 2.5.6

UNIT ANALYSIS

2. TEST AND MEASURING INSTRUMENTS

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To familiarise the students with the use of anlog multimeter for the measurement of d.c and a.c voltages and currents through demonstration, observation and direct practical experience in the laboratory.	Basic idea of using multimeter for various measurements, functions of different knobs.	Ability to handle and operate the meter, seminar, experimentation.	Seminar, Experiments, Discussions, Demonstration	Analog multimeter, Voltage sources (AC and DC) Resistors	Ability to understand facts Ability to handle and to take measurements.
2 To develop the skill in students to use the multimeter for testing different components through demonstration and hands-on experience in the laboratory.	Develop skills to test various components whether it is good or bad comparison of resister values with coded values.	Discussions Experimentation Chart preparation	Experiments, Charts, Demonstration	Analog multimeter various passive and active components	Ability to test the components (experiments) chart preparation.
3 To enhance the skill of the students in using a digital multimeter for testing and measurement through demonstration observations and direct practical work experience.	Develop the skill in using digital multimeter.	Experimentation Presentation	Experiments Discussions	Digital multimeter, various active and passive components	Ability to check components using digital multimeter.
4 To introduce the AF/RF signal generators and function generators to the students through demonstrations and enable them to famililiarise with its applications through direct experience and observations in the laboratory.	Understand the working and uses of AF/RF signal generation and function generation.	Ability to handle the instruments, experimentaiton, discussions, demonstrations	Experiments,Discussions, Demonstration, Assignment	AF/RF signal gnerator/ function generator, CRO amplifier	Understanding of facts, Ability to use AF/RF signal generator and the participation in experiemnt.
5 To introduce the basic working principle of a CRO with the help of a block diagram and demonstration. Also to familiarise them with different applications of the CRO (voltage measurement, frequency measurement, display of waveforms, through demonstrations and follow-up practical work in the laboratory.	Understand functions of CRO and its various applications. Ability to handle the instrument.	Ability to handle the instruments, experimentaiton, discussions	Experiments, Discussions, Demonstration, Survey	CRO , function generator, voltage source	Ability to use the CRO, participation in survey

3 ELECTRONIC COMPONENTS AND DEVICES

3.1 Introduction

Any complex electronics circuit is an assembly of a large number of discrete components and devices. These components differ in size, construction and function from each other. The malfunction of any one of the components may lead to the collapse of the entire circuit. So a technician must have sound knowledge of various components, their functions and their testing. In this unit the function and uses of various types of active and passive components are explained. The construction, working and uses of various types of transformers and relays are also included. It is followed by a study of the working of RLC circuits. Finally semiconductor devices such as diodes and transistors are presented. The teacher should note that the treatment of the subject is continuous from what the students have learn from their secondary classes. So the entire basic details are not repeated. Any how if one feels necessary, a brush up of the previous topics will be very useful for better understanding of the topic.

3.2 Syllabus

Active and passive components: Resistors, Capacitors and Inductors, Transformers and Relays, RLC circuits - Reactance, Impedance and Resonance. Semi conductor devices : PM junction diodes, bipolar transistor.

3.3 Curriculum Objectives

3.3.1 To identify various electronic components and classify them through demonstrations, surveys and collection.

3.3.2 To read the values of resistors and capacitors from their code marks through practical experience in the lab.

3.3.3 To familiarise the students with the testing of resistors, capacitors, inductors through surveys, collection, field visits and seminars, also to identify the faults from the symptoms.

3.3.4 To understand the construction, working and testing of transformers through hands on experience in the lab.

3.3.5 To introduce the concept of inductive reactance, capacitive reactance, importance and series and parallel resonance, through seminars, group discussion and direct practical experience in the lab.

3.3.6 To familiarise the students with various types of relays and their important applications with the help of field visits and observations.

3.3.7 To familiarise the students with different semiconductor diodes their biasing and volt - ampere characteristics through collection, surveys, observations and practical work in the lab.

3.3.8 To familiarise the students with bipolar transistors, their configurations (CB, CE and CC) and amplifying action through direct practical work in the lab.

3.4 Points to discuss :

- Classification of components - active and passive
- Colour coding of resistors, inductors and capacitors Wattage and tolerance of resistors.
- Inductive reactance, capacitive reactance, impedance.
- Resonance in RLC circuits - series and parallel
- The construction, working and testing of transformers
- The working and applications of relays
- Biasing and V-I characteristics of diodes
- Bipolar transistor configuration and amplifying action.

3.5 Learning Activities

3.5.1 First the teacher should give a general presentation of various components and their classification. It should be followed by a demonstration of different components in the lab. Then the students are divided into small groups and asked to conduct a survey of various service centres and laboratories and prepare a chart showing different components, their symbols, important applications and most likely faults.

3.5.2 Introduce the coding methods and testing of resistors, capacitors etc. and give detailed demonstration. Then ask the students to do the same individually.

3.5.3 The student groups are directed to collect sample components or scraps from industrial units or service centres. Then they should be asked to classify the components, test them and read their values and prepare a detailed report accordingly. Then one of the members of the group should present a seminar on one of the items they have collected. Finally the teacher should consolidate the reports and give a brief-up. The performance of each group should be evaluated using different grading indicators.

3.5.4 Give a general presentation about the principle, construction, working, testing and applications of the transformers. Then demonstrate different types of transformer and explain their testing methods and applications. Then divide the students into small groups. Each group is supplied with a few transformers (different types) and a multimeter in the lab. Ask them to test them using multimeter and prepare a report indicating faults if any. Then the groups are asked to conduct observations, and visits to the near by industrial units and service centres and conduct a survey regarding the applications of different transformers. At the end they should submit a report which the teacher should consolidate

and present before the class for a general discussion on the topic. The performance of the student groups should be evaluated using suitable grading indicators.

3.5.5 Begin with a general presentation of the teacher about reactance, impedance and resonance. Then a discussion can be arranged under the effective co-ordination of the teacher about various aspects of RLC circuits and the roles of resistors, inductors and capacitor. At the end of the teacher should highlight the importance of resonance in practical applications with a special mention about the tuners in radio and television receivers.

3.5.6 The teacher should introduce the concept and uses of relays and should give a live demonstration in the lab working of relays with the help of some simple circuits.

3.5.7 Assignment : The students are asked to submit a detailed report about different types of relays and their applications by visiting the nearby industrial units, college/polytechnic labs, or service centres.

3.5.8 Introduce the method of testing semiconductor diodes. Demonstrate different types of diodes and mention their applications. Then students are divided into small groups. Each group is supplied with a diode, regulated d.c supply, Ammeter, Voltmeter and a suitable resistor. Show them how the volt-ampere characteristics of a diode is obtained. Then ask each group to obtain the V-I curves through practical work. Ensure active participation of each member in the group. Evaluate the performance using suitable indicators for lab work.

3.5.9 Introduce the concept of bipolar transistors and their uses. Then divide the students into small groups and ask each group to present a seminar on types of transistors, transistor configuration, biasing, stabilization, etc. At the end of the seminar, a few questions may be asked as a feedback of their understanding of the topic.

3.5.10 Give a demonstration in the lab about the testing of a bipolar transistor. Then ask them to do individually in the lab. Then divide the students into small groups. Each group is asked to collect maximum number of transistor (used or scrap) by visiting the nearby service centres or industrial units. Ask them to classify them and test them in the lab using a multimeter.

3.6 Assignment

Ask the students to prepare a chart on the basis of their visit or survey.

Sl.No.	Transistor trade No.	Si/ Ge	PNP/ NPN	Low freq/ High freq	Power/ Ordinary	Switching/ Amplifying	Imp Application

Evaluate the performance of each group using the suitable grade indicators.

3.7 Seminar, Group Discussion, Assignment

Activity 3.5.4

Activity 3.5.5

Activity 3.5.6

Activity 3.5.8

Activity 3.5.9

3.8 Field visit, Surveys, Collection, Observation

Activity 3.5.1

Activity 3.5.3

Activity 3.5.4

Activity 3.5.6

Activity 3.5.9

3.9 Practical Laboratory work

Activity 3.5.2

Activity 3.5.4

Activity 3.5.7

Activity 3.5.9

3.10 Item for Continuous Evaluation

Activity 3.5.3

Activity 3.5.4

Activity 3.5.6

Activity 3.5.9

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UNIT ANALYSIS

3. ELECTRONIC COMPONENTS AND DEVICES

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To identify various electronic components and classify them through demonstrations, surveys and collection.	Familiarisation of various electronic components and understanding their symbols.	Concept development identification, observaiton	Survey, Demonstration, Collection, Chart	Various active and passive electronic components	Understanding of facts, participation in survey
2 To read the values of resistors and capacitors from their code marks through practical experience in the lab.	Colour codes, Numerical codes, Measuring units	Observation, analysis, evaluation, experimentation	Experimentation, Demonstration, Table preparation, discussions.	Resistors, capacitors, multimeters	Ability to analyse the codes, Ability to find out the value using multimeter.
3 To familiarise the students with the testing of resistors, capacitors, inductors through surveys, collection, field visits and seminars. Also to identify the faults from the symptoms.	Develop the understand whether the given components are good or bad.	Survey, collection, seminars	Survey, collection, field visits, seminars.	Various types of resistors, capacitors and inductors (faculty and genunine, Multimeter)	Ability to find out the fault. Ability to conduct seminar
4 To understand the construction, working and testing of transforms through hands on experience in the lab.	Transformer construction details, testing, fault finding	Survey, Discussions, Fault analysis	Discussions, Demonstration, Survey/ field visit	Various types of transformers, multimeter	Participation in survey, participation in discussions.
5 To introduce the concept of inductive reactance, capacitive reactance, impedance and series and parallel resonance, through seminars, group discussion and direct practical experience in the lab.	Inductive reactance $X_L=2$ fL Capacitive reactance $X_C=$ Impedance, Principle of resonance.	Concept development	Presentation, Discussions	Series and parallel resonance circuits	Understanding of facts.

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
6. To familiarise the students with various types of relays and their important applications with the help of field visits and observations.	Relay switches, various applications	Concept development analysis	Demonstration, Discussion, Assignments	Different types of relays, simple circuits consisting of relays, power supply etc.	Understanding of facts, assignments
7 To familiarise the students with different semiconductor diodes their biasing and volt - ampere characteristics through collection surveys, observations and practical work in the lab.	PN junction, Depletion theory, potential barrier, forward and reverse biasing V-I characteristics	Concept development analysis Experimentation, Observation, Ploting of graph	Discussion, Experiments , Charts	Diodes, Regulated power supply, Rheostat, multimedia, Graphsheet	Ability to analyse observations and results of experiments, Ability to analyse charts and graphs
8 To familiarise the students with biopolar transistors, their configurations (CB, CE and CC) and amplifying action through direct practical work in the lab.	Concept of transistor, transistor as an amplifier, CB, CE and CC - configuration stabilistaiton	Concept development Seminar presentation Discussions	Discussions Seminars, Demonstrations, Survey	Bipolar transistors (Non and PNP) voltage sources, multimeter etc.	Ability to understand facts, Seminar presentaiton

4 SPECIAL SEMICONDUCTOR DEVICES

4.1 Introduction

The latest technologies and radical developments in the field of electronics paved the way for the invention of newer and newer devices so as to suit best for a particular application or to perform a specific or unique task. This unit is intended to create a general awareness of a number of special devices used in electronics. A brief outline of the device is presented along with the most important practical applications of that device. Since the developments are going on and it is not possible to present all the items in the laboratory, it is strongly recommended to adopt strategies such as field visits to cover this unit most effectively.

4.2 Syllabus

Special devices: Zener diode, varactor diode, Tunnel diode, PIN diode, Schottky diode, Gun diode, IMPATT diode, TRAPPAT diode, FET, MOSFET, UJT, SCR, DIAC, TRIAC, VDR, LDR, Thermistor, Opto-electronic Devices : LED, Infrared LED, LCD, Photodiode Phototransistor, Opto Coupler, Opto isolator, CCD, Solar cell, SMD, LASSER Diode, Seven-segment displays, Optical fibre cables.

4.3 Curriculum Objectives

4.3.1 To undertsand the working principle and characteristics of a zener diode and familiarise with its applications through demonstration and hands on work in the laboratory.

4.3.2 To identify a varactor diode, tunnel diode, PIN diode, schottky diod, Gum diode, IMPATT diode, TRAPATT diode and familiarise with their uses through collections laboratory demonstration, observatory surveys and field visits.

4.3.3 To understand the basic principle of a FET and familiarise with its applications through discussion, seminars and demonstrations.

4.3.4 To identify the MOSFET, UJT, SCR, DIAC, TRIAC, VDR, LDR, Thermistor through demonstration, collection, surveys, charts and field visits.

4.3.5 To introduce certain optoelectronic devices such as LED, Infrared LED, LCD, Photodiode, Phototransistor, Optocoupler, CCD, Solar cell seven-segment displays etc. and enable the students to get familiar with these components and their uses through demonstrations, collections, surveys, field visits and expert seminars.

4.3.6 To familiarise the students with the latest developments in component technology such as Surface Mount Devices (SMD) through field visits, surveys and expert seminars.

4.3.7 To enable the students to get familiar with optical fibres through demonstrations and field visits.

4.3.8 To introduce the concept of laser diode through seminars, demonstration and field visits.

4.4 Learning Activities

4.4.1 The teacher should introduce the basic working principle of a zener diode clarifying its difference from an ordinary diode. Then assemble a simple voltage regulator circuit on a bred board and demonstrate, how the voltage variations in the input are regulated by the zener diode. Also show them how to test the zener diode using a multimeter. Then divide the students into small groups and supply each group with a zener diode, d.c power supply, resistors and bread board. Ask the group to perform the experiment, observe the reading and record it. The participation of each student must be ensured. Evaluation can be done using suitable indicators for lab work.

4.4.2 Arrange a demonstration of various special devices (varactor, tunnel, gun, PIN, Schottky, IMPATT, TRAPPAT diodes, FET, MOSFET, UJT, SCR, DIAC, TRIAC, VDR, LDR and thermistors). Display symbols and applications using charts or LCD or OH Projector. Then using a multimeter,, demonstrate the method of testing these devices. Then divide the students into small groups. Each group is then given a multimeter and samples of the above devices. Then instruct them to test these devices using the multimeter and draw their symbols.

4.4.3 Give a demonstration of the optoelectronic devices (listed in the syllabus) and show how they can be tested using a multimeter. Illustrate the symbols and applications using charts or LCD projector. Then form student groups and supply them with these devices and a multimeter. Instruct them to test these devices and draw their symbols.

4.4.5 Using a LCD projector give a visual display of various special devices and give necessary explanation and live demonstration for each device. Also explain the method of testing that device and its main applications. Finally conduct a group discussion to get the feedback of the understanding of the students.

4.4.6 Arrange seminars on these topics by experts from the industry or service professionals.

4.4.7 Conduct field visit to the nearby industrial units and companies and introduce the students the latest trends in this field.

4.4.8 Introduce the basic working principle of FET and its important applications and advanatges with the help of necessary diagrams. Conduct a group discussion or debate on the comparison between bipolar transistors and FETs. Finally conclude it with a brief up from the teacher.

4.4.9 Divide the students into small groups of 4 or 5. Ask each group to conduct a survey of various industrial units and service centre to collect the details of as many special devices as possible. Direct them to get the knowledge about their applications also. Also direct

them to collect maximum samples. If internet facility is available, direct the groups to acquire maximum data from the net.

4.4.10 Assignment

Finally each group may be asked to prepare a chart showing the details of the special devices including their applications. Evaluate the performance of each group using suitable indicators.

Unit test

4.5 Seminar, Group Discussion, Assignment

Activity 4.4.4

Activity 4.4.5

Activity 4.4.6

Activity 4.4.7

4.6 Practical Laboratory work

Activity 4.4.1

4.7 Item for Continous Evaluation

Activity 4.4.1

Activity 4.4.7

Activity 4.4.8

Activity 4.4.9

UNIT ANALYSIS

4. SPECIAL SEMI CONDUCTOR DEVICES

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To undertsand the working principle and characteristics of a zener diode and familiarise with its applications through demonstration and hands on work in the laboratory.	Difference between zener diode and other diodes, testing applications as voltage regulator.	Testing, Experimentation, Observation	Demonstration, Testing, Experiments	Zener diodes of various ratings	Participation in experiments Analysis of results
2 To identify avaractor diode, tunnel diode, PIN diode, schottky diode, Gun diode, IMPATT diode, TRAPATT diode and familiarise with their uses through collections laboratory demonstration, observatory surveys and field visits.	Familiarisation and application of these components	Identification	Charts, Demonstration, Survey, Assignment, Reference	Varactor diode, Tunnel diode, PIN diode, schottky diode, gunn diode, IMPATT TRAPATT	Understanding of facts Ability to identity these components
3 To understand the basic principle of a PET and familiarise with its applications through discussion, seminars and demonstrations.	Types (P and N Channel) characteristics, parameters (I_{DSS}, ■, gm) Pinch-off voltage, lead identification and testing	Analysis, Observation, Checking	Demonstration, Discussion, Ploting of characteristic curve	FET, CRO, Ammeter, Voltmeter	Understanding of facts Identification of leads
4 To identify the MOSFET, UJT, SCR, DIAC, TRIAC, VDR, LDR, Thermistor through demonstration, collection, surveys, charts and field visits.	Identifying and checking, symbolic representation	Familiarise with the applications of these devices and their representation	Discussion, Demonstration, Survey, Charts, Assignment, Collection	MOSFET, UJT, SCR, DIAC, TRIAC, VDR, LDR, Thermistor, STR	Ability to understand the concepts assignments Chart preparation
5 To identify different IC's and familiarise with their applications.	Advantages using ICs. Voltage regulator ICs (78XX and 79XX) 555 times IC, Opamp (741)	Identificatio, Familiarisation, Discussion	Pin Identification, Charts, Discussion, Verification	ICs (78XX, 79XX) 555, 741	Ability to identify pins. Ability to understand uses.

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
6. To introduce certain optoelectronic devices such as LED, Infrared LED, LCD, Photodiode, Phototransistor, Optocoupler, CCD, Solar cell seven-segment displays etc. and enable the students to get familiar with these components and their uses through demonstrations, collections, surveys, field visits and expert seminars.	Identify, Familiarize and understand uses of these components, principle of working.	Familiarization, Identification, Understanding the applications	Assignments, Principle of working, charts, Demonstration, Discussion,	Special devices mentioned in objective	Ability to understand the concepts, participation in discussions. Ability to identify
7. To familiarise the students with the latest developments in component technology such as Surface Mount Devices (SMD) through field visits, surveys and expert seminars.	Concept development	Collections of data Knowledge in advanced technology	Field visits, survey, seminars, discussions	A sample of a SMD magazines	Understanding of facts, Semianrs
8 To enable the students to get familiar with optical fibres through demonstrations and field visits.	Understand fibre optic technology, optical communication	Principles of fibre optic technology	Survey, Field visit, Discussion	Samples of fibre optic cables	Ability to understand facts, Participation in group discussion.
9 To introduce the concept of laser diode through seminars, demonstration and field visits.	Laser principles, application of laser in communication	Principles of lasers	Field visits, Seminars, Demonstration, Discussions	Laser source, fibre optic cable	Ability to understand facts, presentaiton of seminar

5 DC POWER SUPPLIES

5.1 Introduction

Power supplies are an integral part of any instrument or circuit. Proper working of the power supply section needs to be ensured for the smooth functioning of any instrument. In this chapter various types of d.c power supplies are dealt with in detail and a clear practical orientation. Various components of a d.c power supply such as rectifier, and filters need to be given as a review treatment since the students are already familiar with these circuit in their earlier classes. Then a complete d.c power supply is presented in detail followed by a dual power supply used for integrated circuits. Then at the end, the latest type of power supply - SMPS is also included.

5.2 Syllabus

D.C. Power supplies : Rectifier, Fitters, Zener Voltage Regulator, Regulated d.c. power supply, Dual power supply, SMPS.

5.3 Curriculum Objectives

5.3.1 To enable the students to identify various stages in a d.c powersupply through demonstration, general discussions, preparation of charts.

5.3.2 To brush up the idea about half-wave, fullwave rectifiers through group discussions and practical assignments.

5.3.3 To understand the working of capacitor filter; choke-input filter and pi(p) filter circuits through demonstration, seminar and observation of waveform on the CRO.

5.3.4 To familiarise with the working and application of a zener voltage regulator through discussions, class-room transaction and practical work in the lab.

5.3.5 To introduce the concept of a dual power supply through class-room transaction and demonstration.

5.3.6 To create an awareness about the merits and applications of a SMPS through debates and surveys.

5.4 Points to be highlighted

- Rectification by a diod
- Filters
- Voltage regulation

- Battery Eliminator
- Need for dual power supply
- Elements of SMPS

5.5 Learning Activities

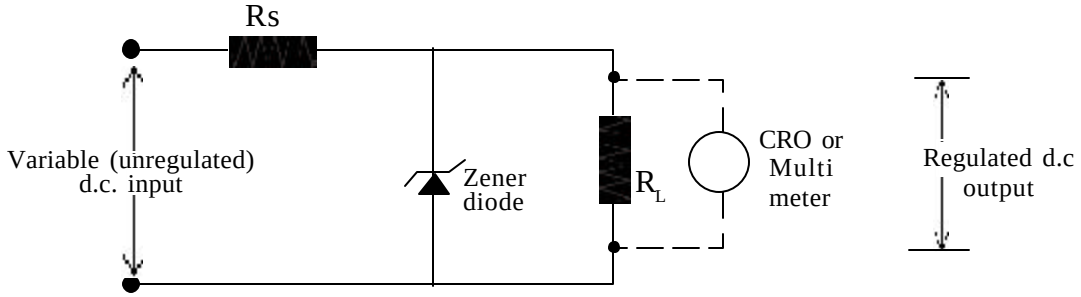
5.5.1 The teacher should begin with a general presentation of the need of regulated d.c. power supplies and should gradually develop it into a general discussion. The lead points of discussion should be the different stages in a d.c. supply unit, the role or function of each stage, the components used in each and the different applications. Finally the teacher should conclude the discussion with a demonstration of the different stages and their functions with the help of a LCD or overhead projector.

5.5.2 The students are divided into small groups. Each group is asked to prepare an illustrative pictorial chart showing the different stages in a d.c. power supply through observatory survey, refering books and materials and from the internet. The chart should be self-illustrative with the description of each block being given as foot notes, the diagrams of waveforms of each stage etc.

5.5.3 Brainstorming method can be adopted to refresh the idea of rectifier very effectively. The conclusion of a debated or discussion between student groups regarding performance comparison of different rectifier circuit may also be tried. Then the groups may be asked to prepare small rectifier circuits at home and demonstrate its working before the class with the help of a CRO.

5.5.4 First the teacher should give an introduction about the necessity of filter circuits and the various types. It should be followed by the demonstration of different filter circuits in the laboratory. The input and output waveform should be illustrated with the help of a CRO.

5.5.5 The basic working principle and the voltage regulating action of a zener diode should be refresh through class-room transaction and discussion. Then in the laboratory, construct a simple voltage regulator circuit using zener diode and give a live demonstration of its working. Then the students are divided into small groups and each group is provided with a bread board, zener diode, variable d.c power supply and suitable resister. Then ask the groups to construct a circuit as given below and record the output voltage each time when the input voltage is varied. Participation of each student must be ensured. Evaluate the performance of the groups using suitable indicators.



5.5.6 The brain storming method can be employed to enlist the essential parts of complete d.c supply. Group discussion may also be tried. The teacher should give a brief-up and it is followed by the demonstration of the working of the circuit in the laboratory. Then the students groups are asked to construct similar circuit in the lab and trace the wave form at each stage. Evaluate their performance using suitable indicators.

5.5.7 Introduce the concept of dual power supply with the help of necessary diagrams through classroom transaction. Then give a demonstration of its working in the laboratory. Then ask the student groups to construct similar circuit in the lab and record the readings.

5.5.8 The concept of switched mode power supply (smps) should be imported through class room transaction. A demonstration of the working of SMPS should be given. Then a group discussion is arranged between student groups with the effective co-ordination of the teacher. The lead points should include the merits of SMPS, its drawbacks and important applications. The session should be completed with a summing up by the teacher.

5.5.9 Assignment : The students are divided into groups. They are asked to conduct visits or surveys of nearby service centres or industrial units and prepare a detailed report on different types of power supplies actually being employed in different practical applications. They should also give a breifing of the working of the circuits, components used and advantages or drawbacks. Finally the teacher should consolidate these reports and arrange a debate or discussion. The performance of each group should be evaluated using suitable indicators.

5.6 Assignment, Seminar, Group Discussion, Brainstorming

Activity 5.4.1

Activity 5.4.3

Activity 5.4.5

Activity 5.4.6

Activity 5.4.8

Activity 5.4.9

5.7 Surveys, Observation, Collection, Preparation of chart

Activity 5.4.2

Activity 5.4.9

5.8 Practical Laboratory work

Activity 5.4.5

Activity 5.4.6

Activity 5.4.7

5.9 Item for Continuous Evaluation

Activity 5.4.2

Activity 5.4.5

Activity 4.4.6

Activity 4.4.9

References

Basic Electronics and Linear Circuits by - N.N.Bharghava

UNIT ANALYSIS

5. DC POWER SUPPLIES

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To enable the students to identify various stages in a d.c powersupply through demonstration, general discussions, preparation of charts.	Block diagram How power supply works	Understand functions of various stages	Discussion, Charts, Demonstration, Audio visual aids	Regulated DC power supply	Understanding of facts. Understanding functions of various stages
2 To brush up the idea about half-wave, fullwave rectifiers through group discussions and practical assignments.	Half wave, centre tap full wave, bridge rectifiers, Ripple factor, efficiency, PIV	Experiments on rectifiesrs, Problem solving demonstration wave form plotting.	Experiments, Problems Demonstration, Discussion	Diodes step down transformers, CRO, Multimeter etc. Bread board	Participation in discussion and experiments. Ability to analyse the working of various rectifiers. Ability to understand facts and to solve problems.
3 To understand the working of capacitor filter; choke-input filter and pi(π) filter circuits	Understand filteration and performance of these filters.	Ability to understand performance of various types of filters.	Demonstration, Observation, Discussion	Rectifier circuits, Different filter networks, CRO	Understanding of facts Ability to analyse outputs of various filter circuits.
4 To familiarise with the working and application of a zener voltage regulator	Working of zener voltage regulator (series and shunt)	Concept development Experimentation Analysis Observation.	Discussion, Experiments, Observation	Zener diode, unregulated power supply (Rectifier cum filter), voltmeter Ammeter, Breadboard	Understanding of facts, ability to analyse the results of experiments
5 To introduce the concept of a dual power supply	Working of dual power supply.	Concept development Demonstration, Discussion	Discussion, Demonstration	Circuit of dual power supply	Understanding of facts. Ability to analyse the circuit.

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
6. To introduce the principle and working of a SMPS	Switched mode power supply	Demonstration, Discussions, Comparison with other power supplies, Observation, Visual display fault analysis	Demonstration, Charts, Discussions, Identification of components used, (SMT, Optocoupler etc)	Power supply unit (SMPS) Voltmeter, TV/ computer	Understanding the working of SMPS
7. To create an awareness about the merits and applications of a SMPS	Understand applications of SMPS and its merits	Surveys, Seminars, Debates	Discussion, Survey, Seminar, Debates	SMPS	Understanding of facts, Participation in debate and survey, Seminar presentation

6 AMPLIFIERS

6.1 Introduction

The amplifier may be regarded as the heart of any electronic equipment or device. Without due amplification, electronic signals or currents are not capable of doing useful work. Hence an amplifier is an integral part of any electronic equipment. This unit is targeted to develop a clear understanding of the basic amplifier circuits. Like most of the other units, this unit also demands definite practical orientation and hands on work in the laboratory because the technician who rushes to servicing with a superficial theoretical knowledge is just like that poor gay who jumped into the water after doing a correspondance course in swimming. With this in mind, the learning strategies adopted in this unit are more or less practical work in the laboratory. Of course, other activities that seem to enhance the understanding of a topic are also supplemented and should be adopted as and where suited.

6.2 Syllabus

Amplifying action of a transistor - Basic Principle. Single stage and multistage amplifiers - voltage amplifiers and power amplifiers- direct coupled, RC coupled and Transformer coupled amplifiers - Class A, Class B and Class C amplifiers Tuned amplifiers - Feedback amplifiers.

6.3 Curriculum Objectives

6.3.1 To refresh the knowledge about the amplifying action of a transistor through seminars and discussions.

6.3.2 To understand the idea of single stage transistor amplifier circuit through demonstration, observation of wave forms and familiarize with its working through practical work in the lab.

6.3.3 To understand the difference between a voltage amplifier and a power amplifier through discussion, debate and preparation of charts.

6.3.4 To familiarise different types of multistage amplifier circuits-direct coupled, RC coupled and transformer coupled - through displays, demonstration observations and practical work.

6.3.5 To introduce the concept of Class A, Class B (push-pull) and Class C amplifiers and their circuits through class-room transaction, demonstration, displays and practical work.

6.3.6 To introduce the concept of tuned amplifier through demonstration and observations.

6.3.7 To introduce the concept of feed back in amplifiers and their circuits through demonstration and observation.

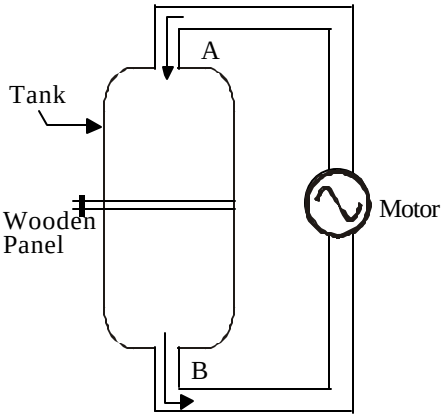
6.4 Points to be highlighted

- Faithful amplification
- Gain, Decibel Gain
- Frequency response
- Bandwidth
- Distortion, Noise
- Input impedance, output impedance, matching
- Stability

6.5 Learning Activities

6.5.1 To brush up the knowledge of the amplification action of a transistor, discussions or seminars may be conducted. The key points should include gain, frequency response, bandwidth, distortion, input and output impedance and stability.

6.5.2 To create a better awareness about the amplification action of the transistor and to highlight the significance of base current the following example may be cited.



6.5.3 Water flows froms A to B in a tank. The water flow is controlled by the wooden panel.

6.5.4 The movements of the panel will produce similar variation in flow. In a transistor current flows emitter to collector.

6.5.5 The base current plays the role of the wooden panel. When an a.c wave form is applied to base, it flectuates. Similar variations will be produced in the collector current also. (Give an illustrative narration using your imagination and skill).

6.5.6 Construct a simple single stage amplifier circuit in the laboratory and give a practical demo. Display the wave forms on the CRO screen. Ask the students to construct similar circuits and display and sketch the waveforms. Evaluate their performance using grading indicators for the lab.

6.5.7 The method of group discussion or debate among student groups can be organized to create a better idea about the difference between voltage amplifiers and power amplifiers. The teacher should play the role of the moderator effectively and make sure the participation of all the students. The key points for the discussion should be the difference in type of transistor, the size of the transistor, need for heatsink, method of coupling, the value of the collector resistance R and the applications of both the types. While winding up the discussion the teacher should highlight these points and sum up interestingly. The groups for debate may also be asked to prepare illustrative charts showing the points of comparison.

6.5.8 The activity session should begin with a general class room presentation of the different methods of coupling in amplifiers. It should be followed by live demonstration of or visual display of the working of the direct coupled or RC coupled amplifiers.

6.5.9 A CRO should be used to monitor the input and output waveforms. Then small student groups are framed and asked construct similar circuits either on a bread board or by soldering on a general PCB. They are instructed to observe the waveform on the CRO screen and measure the output using a multimeters for input signals of different frequencies. The readings and wave forms should be traced and recorded. The performance of the students are to be evaluated using suitable indicators.

6.5.10 The basic concept of class A, class B and Class C amplifiers are first introduced through class room transaction. To familiarize the students with the circuit working, a practical demonstration of both class A and class B push pull amplifier circuits are given. Then the students are instructed to construct similar circuits and display the waveforms on the CRO screen. The waveforms and readings must be recorded.

6.5.11 Introduce the concept of tuned amplifiers through class room transaction. Give a visal presentation using an LCD projector or a live demonstration of the working of the circuit. Display the waveform on the CRO screen. Instruct the students to trace the circuit and observe the waveform.

6.5.12 Introduce the concept of feedback in amplifiers with the help of diagrams. Then brainstorming method may be tried to enumerate the necessity of feed back in amplifiers. Then arrange a discussion focussed on the merits, and demerits of feed back.

6.5.13 Assignment

Frame small groups of students. Ask them to prepare a detailed report about various types of amplifiers used in practical applications by conducting surveys, observations, refering books or magazines or internet, visiting nearby service centres. The report should contain the type of the amplifier, its circuit diagram specifications of components used, working and nature of its applications. The performance of the students should be evaluated using suitable indicators.

6.6 Practical Laboratory work

Activity 6.5.3

Activity 6.5.5

Activity 6.5.6

6.7 Group discussion, Seminar, Assignment

Activity 6.5.1

Activity 6.5.4

Activity 6.5.9

6.8 Item for Continous Evaluation

Activity 6.5.3

Activity 6.5.3

Activity 6.5.5

Activity 6.5.6

Activity 6.5.9

References

Basic Electronics and Linear Circuits by - N.N.Bharghava

Transistors Work Like This - Egon Larson

Solid State Electronic Devices - Ben.G.Streetman, Sanjay Banerjee

UNIT ANALYSIS

6. AMPLIFIERS

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To refresh the knowledge about the amplifying action of a transistor through seminars and discussions.	Refresh the amplifying action of transistor	Concept development seminar	Discussion, Demonstration, Seminars	Single stage amplifier circuit CRO	Seminar presentation
2 To understand the idea of single stage transistor amplifier circuit through demonstration, observation of wave forms and familiarize with its working through practical work in the lab.	Single stage CE amplifier, Functions of various components. Frequency response	Experimentation Discussion Analysis, Waveform plotting	Experiments, Observations, Analysis	Transistors, resistors capacitors (single stage amplifier) CRO, Multimeter etc.	Ability to do experiment. Ability to analyse the result
3 To understand the difference between a voltage amplifier and a power amplifier through discussion, debate and preparation of charts.	Difference between voltage and power amplifier. (transistor used value of RC, heat sink etc)	Debates, Discussion, chart preparation	Discussion, Debates, Charts	Voltage and power amplifier circuits	Participation in debate and group discussion. Chart preparation.
4 To familiarise different types of multistage amplifier circuits-direct coupled, RC coupled and transformer coupled - through displays, demonstration observations and practical work.	Coupling Direct coupled, RC coupled and transformer coupled amplifiers.	Understanding the difference in performance and application through demonstration, displays observation, practical	Demonstration, Experiments, Discussion, Training of waveforms, Observation	Direct coupled, RC coupled, Transformer coupled amplifiers (or components for constructing there amplifiers, Bread board, CRO Multimeter	Experiments waveform tracing
5 To introduce the concept of Class A, Class B (push-pull) and Class C amplifiers and their circuits through class-room transaction, demonstration, displays and practical work.	Class A, Class B, Class C (concepts and circuit working)	Experimentation, Discussion, Recording	Experiments, Observation, Analysis	Class A, Class B push pull, class C amplifiers circuits, multimeter, CRO etc.	Ability to understand facts, participation in experiments, recording and analysing the result.

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
6. To introduce the concept of tuned amplifier	Concept development	Observation and tracing of waveform	Discussion, Observation, Tracing	Voltage tuned amplifier circuit, CRO, Multimeter etc.	Ability to analyse the output. Tracing
7. To introduce the concept of feed back in amplifiers and their circuits	Concept of feed back in amplifiers (+ve and -ve) merits and demerits.	Discussions with examples Analysis	Discussion, Demonstration	CE amplifier, CRO	Understanding of facts, Participation in discussions.

7 OSCILLATORS

7.1 Introduction

Oscillators are electronic devices used for the generation of electrical oscillations of any desired frequency. In many electronic devices or appliances it may require to convert the available d.c supply voltage into an alternating waveform of some fixed frequency. In such cases oscillators are used. The applications include radio, television, taperecorder, quartz watches, metal detectors, computers, ...etc. This unit is framed to familiarize the students with some of the most commonly used electronic circuits in practical ocasions. The fundamental concepts oscillators which the student have already acquainted with from their previous class are not repeated here. Anyhow a brush-up treatment the basics may be included through seminars or group discussions, if the teacher considers it necessary.

7.2 Syllabus

Transistor Oscillator - need for feedback. Hartley Oscillator Collpitt's Oscillator, RC Phase shift Oscillator and Crystal Oscillator.

7.3 Curriculum Objectives

7.3.1 To create a basic understanding of a transistor oscillator and to aware them about the need for feed back through discussion and demonstration.

7.3.2 To introduce the circuit of a Hartley Oscillator and to familiarise with its working through demonstration and practical work in the lab.

7.3.3 To familiarise with the Collipitts Oscillator circuit through demonstration, observation and practical work.

7.3.4 To understand the basic principle of a RC phase shift oscillator and familiarize with its circuit through demonstration, observation and practical work in the lab.

7.3.5 To familiarize with the working of a crystal oscillator through demonstration and observation.

7.4 Points to be highlighted

- Basic tank circuit
- Damped and undamped oscillations
- Conditions for positive - feedback
- Merits and demerits of different oscillators

- Applications of different oscillators.

7.5 Learning Activities

7.5.1 Introduce the concept of mechanical oscillators through the demonstration of a moving pendulum. Then show them the damping of oscillations unless being energised through keying. Then use the brainstorming method to choke out a solution for the damping of oscillation. Through careful planning and moderation during the briefing up, introduce the concept of positive feed back. Use necessary charts or diagrams to illustrate damped and undamped oscillations.

7.5.2 Instruct the students to go through their previous year's textbook on oscillators and arrange seminars and group discussions on basic tank circuit and the principle of a transistor oscillator.

7.5.3 Construct a simple Hartley oscillator circuit on a breadboard and give a practical demonstration of its working in the lab. Monitor the waveforms on the CRO screen and ask the students to observe it. Then frame student group and let them construct the circuit individually. They should display the output waveforms on the CRO and sketch it on a graph paper. Evaluate their performance with the help of suitable grade indicators.

7.5.4 Construct a Collpitt's oscillator circuit in the lab and give a live demonstration. Then the student groups should be asked to construct similar circuit and display the output waveform. Participation of each and every student needs to be ensured. Evaluate their performance.

7.5.5 Construct a RC phase shift oscillator circuit in the lab and give a practical demonstration of its working. Then instruct the students to perform the same individually and display and sketch the output waveform. Evaluate their performance.

7.5.6 Introduce the concept of crystal oscillators through class room transaction and give a practical demonstration of its working in the lab.

7.5.7 Group discussion: Divide the students into four groups. Each group should be asked to prepare a note about the merits and applications of one of the above four types of oscillators. Then construct a discussion or debate on the comparison of the four oscillator circuit. Finally give nine conclusion highlighting the important applications of each type and pointing out the other types of oscillators.

7.5.8 Assignment : The students are divided into small groups and ask them to prepare a detailed report about the important types of oscillators (other than the four discussed here) used in practical devices by conducting a survey, field visits or referring books or magazines or internet. The report should contain the circuit diagram, components used working, mertis, demerits and important applications. Each student should be asked to submit the report.

7.5.9 Practical Laboratory work

Activity 7.5.3

Activity 7.5.4

Activity 7.5.5

7.5.10 Group discussion, Seminar, Assignment

Activity 7.5.2

Activity 7.5.7

Activity 7.5.8

7.5.11 Survey, Field visit, Charts, Collections

Activity 7.5.1

Activity 7.5.2

Activity 7.5.8

7.5.12 Item for Continous Evaluation

Activity 7.5.3

Activity 7.5.4

Activity 7.5.5

Activity 7.5.8

References

Basic Electronic and Linear Circuits by - N.N.Bharghava

UNIT ANALYSIS

7. OSCILITORS

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To create a basic understanding of a transistor oscillator and to aware them about the need for feed back	Barkhausen criteria positive feedback	Discussion Chart preparation	Demonstration, Discussion, Charts	Charts, Audio visual aids, oscillator circuits.	Ability to understand facts.
2 To introduce the circuit of a Hartley Oscillator and to familiarise with its working		Reference skills, Seminars, group discussion, experiment ation, observation & plotting	Demonstration, Seminars, group discussion, experiment in lab, reference	Visual aids, CRO, circuit components of hartley oscillator, reference books	Ability to conduct experiment analyse output
3 To familiarise with the Collipitts Oscillator circuit		Refernece skills, group discussion, Experimentation, Observation	Demonstration, discussion, experiment in lab, reference	CRO, circuit components of collpitts oscillator	Ability to conduct experiment and to analyse output
4 To understand the basic principle of a RC phase shift oscillator and familiarize with its circuit		Experimentation, Observation, Analysis	Demonstration, Discussion, Experiment	CRO, circuit components of RC phase shift oscillator	Ability to conduct experiment and to analyse output
5 To familiarize with the working of a crystal oscillator through demonstration and observation.	Piezo-electric effect	Discussion, Analysing	Class room transaction, demonstration, discussion, charts.	Charts, audio visual aids	Understanding of facts

8 SWITCHING AND WAVESHAPING CIRCUITS

8.1 Introduction

A circuit used to make or break the flow of current in a circuit or device is known as a switching circuit. It can also be used for modifying the wave form into a desired shape. Transistors are the widely used switching elements. Diacs, triacs, SCRs, UJTs, etc. can also be used as switching elements. Very high switching speed and the absence of sparks or wear and tear makes electronic switches more preferrable them mechanical switches. In this unit, we come across with a few of the important switching or waveshaping circuits. Remember that, a perfect idea of the switching action of a transistor is a most to get a clear understandings of the working of the circuit. So it needs to be refreshed through seminars or discussions, if the teacher thinks it necessary.

8.2 Syllabus

Multivibrators - Astable, Monostable and Bistable multivibrators, Schmitt trigger, Differentiator, Integrator, Clipper and Clamper circuits.

8.3 Curriculum Objectives

8.3.1 To understand the working of a transistor astable multivibrator circuit through observation and familiarize with the circuit through practical work.

8.3.2 To understand the basic concept of monostable multivibrator by observation and familiarize with it through demonstration.

8.3.3 To understand the working of bistable multivibrator by observation.

8.3.4 To introduce the schmitt trigger and familiarize with the circuit through observation.

8.3.5 To familiarize the differentiator and integrator circuits through observations and practical work.

8.3.6 To familiarize various clipper circuits (positive, negative and biased) through observation and practical work.

8.3.7 To familiarize various clamper circuits (positive, negative) through observation and experimentation.

8.4 Points to be highlighted

- Advantages of electronic switches over mechanical switches.

- Switching action of a transistor
- Multivibrators - applications
- Schmitt trigger - applications
- Applications of differentiator and integrator
- Applications of clipper and clamper circuits.

8.5 Learning Activities

8.5.1 Conduct a debate or group discussion to create a clear understanding of the advantages of electronic switches over mechanical switches. The key points for discussion are switching speed, sparks mechanical friction, and wear & tear.

8.5.2 Arrange seminars on the switching action of a transistor. During conclusion of the seminar, clarify the differences between an ordinary transistor and a switching transistor.

8.5.3 Give a class room presentation about the basic concept of multivibrators. Then construct an astable multivibrator on a breadboard using descrete components and demonstrate its working. Display the wave form on the CRO. Then instruct the students to construct similar circuit and display and trace the waveforms individually Evluate their performances using suitable indicators.

8.5.4 Repeat Activity 8.5.3. for monostable and bistable multivibrators.

8.5.5 Frame small groups of students and ask them to conduct a survey about the practical applications of multivibrators. They should submit their report to the teacher. The teacher should consolidate these reports and give a presentation in the class.

8.5.6 Introduce the basic concept of a schemitt trigger through class room transaction. Then give a practical demonstration of the circuit working and wave form in the lab. Then ask the students to do the experiment individually and trace the waveform from the CRO screen. Evaluate their performance.

8.5.7 Start with a class-room presentation of the idea of differentiator and integration followed by a live demonstrator of the circuit and waveforms in the lab. Ask the students to observe the input and output waveforms. Instruct them to construct similar circuits and observe and record the output waveforms for different input waveforms (square, rectangular, triangular....etc.)

8.5.8 Arrange a seminar on various wave shapping circuits and their applications.

8.5.9 Introduce the concept of clipping circuits through class-room transaction. Then give a practical demonstration in the lab. Ask the students to construct different types of clipper (positive, negative and biased) circuits and trace the input and output wave forms.

8.5.10 Introduce the basic concept of clamping circuits in the class followed by a demonstration in the lab. Then repeat activity 8.5.9 for different clamper circuits. Evaluate their performance using suitable grade indicators for lab work.

8.5.11 Class test : Give a simple class test to get the feed back of the understanding of the topic.

8.6 Practical Laboratory work

Activity 8.5.3

Activity 8.5.4

Activity 8.5.6

Activity 8.5.7

Activity 8.5.9

Activity 8.5.10

8.7 Group discussion, Seminar, Assignment, Debate

Activity 8.5.1

Activity 8.5.2

Activity 8.5.8

8.8 Survey, Field visit, Charts, Collections

Activity 8.5.5

8.9 Item for Continous Evaluation

Activity 8.5.3

Activity 8.5.4

Activity 8.5.6

Activity 8.5.7

Activity 8.5.9

Activity 8.5.10

Activity 8.5.11

References

Electronic Devices and Circuits - BOGART

The Art of Electronics - Paul Horowitz Winfield Hill

UNIT ANALYSIS

8. SWITCHING AND WAVE SHAPING CIRCUITS

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To understand the working of a transistor astable multivibrator circuit through observation and familiarize with the circuit through practical work.	Electronic switching, Astable multivibrator, using descrete components	Debates, Experimentation, Observation, Seminar	Debates, Experiments, Observation, waveform plotting seminar	Bread board, Transistors, Capacitors, Resistors, CRO, Power supplies	Participation in debates and experimentation seminar presentation
2 To understand the basic concept of monostable multivibrator by observation and familiarize with it through demonstration.	Concept of monostable Familiarisation with the circuit operation.	Discussion, Demonstration, Familiarisation of circuit	Demonstration, Observation	Monostable multivibrator circuit.	Ability to understand facts, Discussion
3 To understand the working of bistable multivibrator by observation.	Concept of bistable multivibrator	Discussion Observation, Survey	Discussion, Observation, Survey	Bistable multivibrator circuit	Understanding of facts, participation in survey
4 To introduce the schmitt trigger and familiarize with the circuit through observation.	Concept of schmitt trigger circuit and its operation	Discussion, Demonstration, Observation	Discussions, Observation, Demonstration	Schmtt-trigger circuit	Understanding of facts
5 To familiarize the differentiator and integrator circuits through observations and practical work.	Concept of low pass, high pass and band pass filters, familiarisation of integrator and differentiator	Demonstration, Discussion, Experimentation, Observation, wave form tracing	Demonstration, Discussion, Experiments	Resistors, Capacitors, Voltage sources, CRO, Multimeter	Ability to do practical, Ability to analyse the outputs.
6 To familiarize various clipper circuits (positive, negative and biased) through observation and practical work.	Simple and biased clipper circuits.	Demonstration, Experimentation, Discussion	Experiments, Group Discussion, Assignment Observations	Diodes, Resistors, DC power supplies, multimeter, CRO, etc.	Ability to do experiments, assignments
5 To familiarize various clamper circuits (positive, negative) through observation and experimentation.	Different clamper circuits operation	Demonstration, Experimentation, Discussion	Experiments, Group Discussion, Observations, Analysis	Diodes, Resistors DC power supplies, Multimeter, CRO, etc.	Participation in experiments, Analysing the results

9 INTEGRATED CIRCUITS AND DIGITAL TECHNOLOGY

9.1 Introduction

The invention of integrated circuits (IC) during the 1960s was a major break through because it did away the need for mechanically connecting the discrete components. Moreover because of its precision, compactness and low power consumption, ICs converted electronic circuits and devices into more compact and cost-effective. Also it paved the way for a rapid revolution in the field of digital electronics. The main objective of this unit is to familiarize the students with integrated circuits and digital technology and to introduce a few of the common ICs which are used very often in electronic circuits. The changes and developments in this field is of such a pace that almost a new IC is introduced day by day. So in a limited context like this it is not practical to cover the details of the entire IC family in a single stretch. But the teacher should take initiative to create awareness among students about the latest trends and developments by arranging seminars by industrial experts or through field visits and seminars.

9.2 Syllabus

Basic concept of ICs. Merits and limitations of ICs. Important fields of applications, Scale of integration - SSI, MSI, LSI and VLSI. Pin identification of ICs, Types of ICs - Analog and digital (comparisn only). Familiarisation of analog ICs (IC-555 and IC 741 IC 78XX and 79XX only). Introduction to digital ICs - Types - CMOS and TTL. 74XX series (introduction only).

Digital Electronics - Introduction to binary number system. Concept of bit and byte. Introduction to logic gates - OR, AND, NOR, NAND, NOT, X-OR - symbols and truth tables. Introduction to flip-flops- JK, SR, T, D (Basic treatment only) Introduction to shiftregisters and digital counters (Fundamentals only) Analog-to-Digital (A/D) converters and Digital-to Analog (D/A) converters. Multiplexers and demultiplexers (introduction only) and Modems.

9.3 Curriculum Objectives

9.3.1 To introduce the basic concept of ICs and familiarization of different types and their applications through class room transaction, demonstrations and observatory surveys.

9.3.2 To create an awareness about merits and limitations of ICs through group discussions or debate.

9.3.3 To introduce the scale of integration in ICs (SSI, MSI, LSI, VLSI and ULSI) through classroom transaction and charts.

9.3.4 To enable the students to identify the pin configuration of ICs (741 and 555, 78XX, 79XX) only through demonstration, display observations, preparation of charts and simple practical work in the lab.

9.3.5 To introduce the different types of digital ICs (CMOS and TTL) and their applications through charts, demonstrations and surveys.

9.3.6 To introduce the concept of binary number system, bit and byte through class room presentation, discussion games and other interesting activities.

9.3.7 To introduce the concept of logic gates (OR, AND, NOR, NAND, NOT, X-OR) through class room transaction, preparation of charts, games, ... etc. and enable them to get familiarized with their truth-tables through interesting practical activites in the lab.

9.3.8 To introduce the concept of flip-flops (basic treatment) through discussion, charts and games.

9.3.9 To introduce shift registers and counters through discussions, charts, display, demonstration or even games.

9.3.10 To introduce the basic concept of A/D and D/A converters through discussion, charts and displays and to familiarise them with their application through observations and surveys.

9.3.11 To familiarize them with the basic idea of multiplexers and demultiplexers and their applications through displays, charts, demonstrations or games.

9.3.12 To introduce the basic concept of modems through class room presentation, demonstration or displays or charts. To familiarise with its applications through surveys, field visits and assignments.

9.4 Learning Activities

9.4.1 Divide the entire students of the class into two groups. Supply each group with a collection of a few articles (say tools, or small containers, books, choke boxes, charts..etc) and a small hard-board box. Ask one group to fill the box with the given articles in a random manner (without any order) and the other group to pack the articles in an arranged and ordered fashion. Illustrate the difference and give a brief-up regarding how various components are systematically arranged or fabricated in an IC.

9.4.2 Instruct the students to frame small groups and visit the nearby service centres and industrial units to collect as many ICS (scraps or used) and also to conduct a survey about various ICs used in practical circuit. At the end they should be asked submit a report to the teacher. Finally the teacher should consolidate these reports and prepare a chart, classifying the ICs depending upon their type and nature of applications.

9.4.3 The student groups are asked to refer their previous year's books or other reference books about the advantages and limitations of ICs. Then conduct a debate or group discussion. The key points should be size, power consumption, reliability and cost.

9.4.4 The idea of scale of integration is imparted through classroom presentation. Then divide the students into four groups. Each group is then asked to prepare a chart listing the ICs belonging to a particular scale (ie LSI or MSI) and indicating its application by referring books, internet or surveys.

9.4.5 Give a demonstration of the pin details of IC-555, IC-741 and IC-78xx,IC-79xx with the help of charts or displays. Then construct a simple circuit using IC-555 and IC-741 on the bread board (eg: Alternate LED.... glow display) and explain its working. Then instruct the students to form groups and construct at least one such hobby circuit at home (or in the lab) using these ICs. One of the members of the group should demonstrate its working in the class (or lab) and explain.

9.4.6 Introduce different types of digital ICs through classroom transaction and display or charts. Mention their important applications.

9.4.7 Assignment: Instruct the students to submit a report about various digital ICs and their applications.

9.4.8 Introduce the concept of binary number system through some interesting game or activity.

9.4.9 Introduce different logic gates through charts, display using LCD projector or games and familiarize them by doing practical work in the lab and preparing attractive charting showing the symbol and the truth table for each gate.

9.4.10 Familiarize the student with the different flip-flops (JK, SR, T, D) and their working through demonstration or displays, discussion, games and attractive charts. Construct a JK flip-flop on a breadboard using IC. Demonstrate its working using LED display. Then instruct the students to observe it and construct similar circuits for SR, T and D flip-flops. Ask them to prepare the truth table. Evaluate their performance.

9.4.11 Introduce the concept of shift registers and counters through discussions, demonstration and displays. Construct a simple digital counter (say 1 to 10) using IC and demonstrate its working. Then ask the students to construct similar circuit and prepare the table. Evaluate their performance.

9.4.12 Familiarize the students with the working of A/D and D/A converters through demonstrations, illustrative displays with an LCD projector.

9.4.13 First impart the basic idea of multiplexers and demultiplexers through classroom transaction and interesting games or displays. Then familiarize them with their working through demonstration.

9.4.14 Introduce the basic concept of modems through classroom transaction and discussion. Then give a live demonstration or visual display using LCD projector about its working.

9.4.15 Assignment

Instruct the student to prepare a detailed report about different types of modems commercially available and their application. Evaluate their performance using suitable grade indicators.

9.5.16 Unit Test

Conduct a simple test to know the level of understanding of the topic.

9.6 Practical Laboratory work

Activity 9.4.5

Activity 9.4.8

Activity 9.4.9

Activity 9.4.10

9.7 Group discussion, Seminar, Assignment, Debate

Activity 9.4.2

Activity 9.4.3

Activity 9.4.6

Activity 9.4.14

9.8 Survey, Field visit, Charts, Collections

Activity 9.4.2

Activity 9.4.4

9.9 Item for Continous Evaluation

Activity 9.4.6

Activity 9.4.14

References

Fundamentals of Digital Electronics - Malvino & Leech

Principles of Digital Electronics - Moris Meno

UNIT ANALYSIS

9. INTEGRATED CIRCUITS AND DIGITAL TECHNOLOGY

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To introduce the basic concept of ICs and familiarization of different types and their applications	Integration	Group discussion, Survey, Observations, Making report, presentation	Group discussion, Class room transaction, demonstation, Observatory surveys, Report making	Audio visual aids, charts	Understanding of facts
2 To create an awareness about merits and limitations of ICs	Merits & demerits of IC. Size, power consumption, reliability and cost	Disucssion Presentation	Reference of books, debate/group discussion	Audio visual aids, Discussion	Good understanding about IC parameters
3 To introduce the scale of integration of ICs	SSI, MSI, LSI, VLSI	Group discussion, Preparing charts	Chart preparation Identification of different ICs, Discussion	Different ICs, Audio Visual aids	Understanding of IC integration methods
4 To enable the students to identify the pin configuration of ICs (741 and 555, 78XX, 79XX)	Terminal indentification .... Difference between 78XX & 79XX series IC chips	Observation, Experimentation, Analysis	Experimentation using IC-555, 741, 78XX, 79XX chart preparation, display	ICs-555, 741, 78XX, 79XX, Charts CRO, LEDs	Familiarisation & Pin identification of 555, 741, 78XX, 79 XX
5 To introduce the different types of digital ICs (CMOS and TTL) and their applications	CMOS TTL Types & difference	Identification , Familiarisation, Chart preparation	Collection of different ICs – good/bad, Discussion	Survey, Demonstration, Charts	Basic concpet of Digital IC technology
6 To introduce the concept of binary number system, bit and byte	$(\ )_2 = (\ )_{10}$ 1byte = 8 bits	Problem solving, presentation, discussion	Games, discussion, class room presentation, problem	Black board	
7 To introduce the concept of logic gates	AND, OR, NOT, NAND, NOR, X-OR	Demonstration, Experimentation, Discussion	Class room transaction, preparing charts, games	Audio visual aids, charts, practical implementation in lab using passive capacity	Familiarisation of truth table of different gates.

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
8.To introduce the concept of flip-flop	JK, SR, T, P	Chart preparation, Analysis	Discussion, charts and games	Black board	
9 To introduce shift registers and counters	Merits & demerits of IC. Size, power consumption, reliability and cost	Analysis, design	Discussion, charts, display, demonstration, games	Audio visual aids, charts.	Familiarisation of JR, SR, T & D Flip flop
10 To introduce the basic concept of A/D & D/A converter	Analog digital – A/D Dig – Analog – D/A	Chart preparation, analysis, survey, concept development	Discussion, charts, display, demonstration	Charts, audio visual aids	Identification of facts
11 To familiarise with the basic idea of multiplexers & demultiplexers and their applications	Multiplexer – One to many, Demultiplexer – Many to one	Identification, analysis, concept development	Discussion, charts, display, demonstration, games	ICs - Multiplexers and Demultiplexers	Fmiliarissation of the uses
12 To introduce the basic concept of modems & to familiarise the applications of it.	A-D & D-A converts applications	Assignment, chart, preparation, analysis	Class room presentation demonstration, & charts survey, field visits assignments	Audio Visual aids, charts field visits.	Understanding the modem and its application

10 AUDIO ENGINEERING

10.1 Introduction

Sound is a very important form of message which is very commonly used for communication. So a good idea about the basic qualities of sound and various acoustic transducers is highly war rented and inevitable for the better understanding of most of the communication systems and equipments. This chapter is aimed to create a basic understanding of the properties of sound and its transducers- microphones and loud speakers. Considering the vast range of these devices, it may not be practical to go through the details of each and every type. Hence the approach is confined to the study of the basic or standard type in detail and familiarize the varieties through demonstrations and discussions. Anyhow the teacher should be at will to split the details as and when required.

10.2 Syllabus

Characteristics of sound – Amplitude, frequency, phase, wavelength; Moving Coil microphone – Principle, Construction, Working and Applications; Ribbon, Crystal, Carbon Condenser, Electret, Tie-clip, Wireless (FM) Microphones- Familiarization and uses only (Details not necessary), Moving Coil loudspeaker- Principle, Construction, Working and Applications, Electrodynamic and Horn type loudspeaker-Familiarization and use only; Baffles, Enclosures, Tweeters, Woofers, Squakers and Cross-over networks. (Basic concept only)., Magnetic Recording and reproduction- Basic principle only; Optical Recording and reproduction- Basic principle only.

10.3 Curriculum Objectives

10.3.1 To create a basic idea regarding the important characteristics of sound such as amplitude, frequency, phase and wave length through class-room transaction and discussion.

10.3.2 To familiarize the students with the construction, principle, working and applications of a moving coil microphone through discussion, demonstration and displays.

10.3.3 To enable the students identify different types of microphones- ribbon, crystal, carbon, condenser, electret, tie-clip, and wireless (FM) types- and familiarize them with their important applications through demonstration, charts, displays, surveys and assignments.

10.3.4 To introduce the basic principle of a moving coil loudspeaker and familiarize them with its construction, working and applications through class-room transaction, demonstration displays and discussions.

10.3.5 To familiarize the students with electrodynamic and horn type loudspeakers through discussion, demonstration displays, charts and surveys.

10.3.6 To introduce the basic idea of baffles, enclosures, tweeters, woofers, squakers and cross-over networks through discussions, seminars, demonstrations, surveys, displays, charts...etc.

10.3.7 To introduce the basic concept of magnetic recording of sound with the help of classroom transaction, discussion, displays and charts.

10.3.8 To introduce the basic concept of optical recording of sound on a disc through classroom transaction, discussion, displays and charts.

10.4 Learning Activities

10.4.1 The teacher should begin with a class-room presentation about the properties of sound. Then conduct a discussion among the students about variety of sounds they hear or listen. The key points of discussion should be the amplitude frequency, phase and wavelength. Then student groups are formed and asked to conduct a survey of the surrounding nature to observe different types of sounds. Ask them classify these sounds into different groups according to their frequency or amplitude. Each group should prepare a list and read out in the class. The teacher may then consolidate these lists and prepare a chart and give a general conclusion in the class.

10.4.2 Introduce the concept of moving coil (dynamic) microphone through class-room transaction. Then give a live demonstration of its helping in the laboratory. Then with the help of diagrams, charts or an LCD projector explain the details of its construction. Arrange a discussion among the students about different types of moving coil microphones and their application. Get the feed back through a few simple questions.

10.4.3 Give a demonstration of various types of microphones and highlight their merits, drawbacks and specific applications. Use charts or L.C.D projector to create better idea about them within the students. Then divide the students into small groups and ask them to conduct a survey or visit the nearby service centres to collect more details and samples of different types of microphones. One of the members of the group may be asked to conduct a seminar on different types of microphones. Assignment may also be given to prepare a detailed report about different types of microphones, their advantages, drawbacks and important applications. Evaluate the performance using suitable indicators.

10.4.4 Introduce the basic principle of a moving coil loudspeaker through class-room presentation. Then arrange a demonstration or display using LCD projector or charts about its construction and working. Try the brainstorming method to enlist the main applications of it.

10.4.5 Introduce the basic concept of electrodynamic and horn type loudspeakers through class-room transaction. Then conduct a discussion among student groups regarding their merits, drawbacks and application. If possible give a practical demonstration of their working.

10.4.6 Start with a general class-room presentation about baffles, enclosures, tweeters, woofers, squakers and cross-over networks. Then divide the students into small groups and ask each group to collect the details of a particular item through surveys or field visits, from reference books, magazines or internet. Each student should ensure participation. Then they should prepare a detailed report on that topic and submit it to the teacher. Make necessary corrections and ask one of the members of the group to conduct a seminar on that topic. Evaluate the performance using suitable grade indicators.

10.4.7 Conceive the basic idea of magnetic recording of sound through class-room transaction. Use conveniant modes of display or demonstration such as charts or LCD projector. Get the feed back of the level of understanding through a few simple questions.

10.4.8 Introduce the idea of optical recording through class-room presentation and demonstration or display of charts or using a LCD projector. Get the feedback about the understanding of the topic through a few simple questions or a class test.

10.5 Group discussion, Seminar, Assignment, Debate

Activity 10.4.1

Activity 10.4.2

Activity 10.4.3

Activity 10.4.4

Activity 10.4.5

Activity 10.4.6

10.6 Survey, Field visit, Charts, Collections

Activity 10.4.1

Activity 10.4.3

Activity 10.4.6

10.7 Item for Continous Evaluation

Activity 10.4.1

Activity 10.4.3

Activity 10.4.8

UNIT ANALYSIS

10. AUDIO ENGINEERING

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
1.To create a basic idea regarding the important characteristics of sound such as amplitude, frequency, phase and wave length	Basic knowledge, characteristics of sound	Concept development, survey, observation	Discussion, Survey, Observation	Different devices, producing sound	Understanding of facts, Participation in Survey
2 To familiarize the students with the construction, principle, working and applications of a moving coil microphone.	Conversion of sound energy into electrical energy constructional departs and working of moving coil loud speaker	Concept development, survey,discussions	Discussion, Survey, Preparation of charts	Moving coil microphone, Amplifier, Loud speaker, etc. Diagrams	Ability to understand working of moving coil microphone
3 To enable the students identify different types of microphones- ribbon, crystal, carbon, condenser, electret, tie-clip, and wireless (FM) types- and familiarize them with their important applications	Ribbon, crystal, carbon, condenter, electrert, tie-up and wireless	Assignment, Discussion, Survey	Discussions, Assignments, Charts	Different types of microphones Audio Visual aids	Assignment, Chart preparation
4 To introduce the basic principle of a moving coil loudspeaker and familiarize them with its construction, working and applications	Familiarise the constructional details and working of moving coil loud speaker.	Discussion, Charts, Presentation	Discussions, Observation	Moving coil loud speaker, Amplifier, Microphone etc.	Ability to understand working of moving coil loud speaker
5 To introduce the students with electrodynamic and horn type loud speakers.	Difference between dynamic and electro dynamic loud speakers. Basics of horn type loud speaker, merits, draw backs, applications.	Group Discussion, Presentation	Demonstration, Discussion, Presentation	Dynamic & Electro dynamic loud speaker, horn type loud speaker Charts, Audio visual aids	Ability to understand facts.

Curriculum Objectives	Concept/ideas	Process skills	Activities	Learning materials	Evaluation
6.To introduce the basic idea of baffles, enclosures, tweeters, woofers, squakers and cross-over networks	Concept development and application.	Survey/field visit Demonstration, Presentation	Discussion, Survey, Presentation	Audio visual aids charts, magazines, etc.	Ability to collect max. details through survey or other methods.
7 To introduce the basic concept of magnetic recording of sound	Principles of magentic recording	Concept development Observation	Discussion, Demonstration, Chart preparation	Recording/play back head,Tape recordes audio cassettes	Understanding of facts
8 To introduce the basic concept of optical recording of sound on a disc	Optical recording/ reproduction principle	Concept development Comparison with magnetic recording	Discussion, Observations, Assignments	CD player, CD writer, CDR, CDRW, Pickup unit	Understanding of facts

Part III
Practicals

LIST OF PRACTICAL EXPERIMENTS

1. Drawing of electronic symbols
2. Soldering practice
3. PCB fabrication
4. Fabrication of an extension board
5. Verification of Ohm's law
6. Verfication of Kirchoff's Current law
7. Verification of Kirchoff's Voltage law
8. Multimeters
9. Cathode Ray Oscilloscope
10. Diode characteristics
11. Zener voltage regulator
12. Half wave rectifier
13. Centre-tapped fullwave rectifier
14. Bridge rectifier
15. DC Regulated Power Supply Using IC (78XX and 79XX)
16. Dual Power Supply
17. RC Coupled amplifier
18. Hartley oscillator
19. Collpitt's oscillator
20. RC Phase shift oscillator
21. Astable multivibrator
22. Integrating circuit
23. Differentiating circuit
24. Clipper circuits
25. Clamper circuits
26. Analog ICs - 741 and 555
27. Digital ICs - 74XX

EXPERIMENT 1 - DRAWING OF ELECTRONIC SYMBOLS

Objective

To familiarize the symbols used in the drawing of electronic circuits.

Component Name	Symbols

EXPERIMENT 2 - SOLDERING PRACTICE

Objective

To practice soldering

To practice desoldering

To practice handling of tools and components

To familiarise the circuit connections

Materials Required

Common PCB, soldering iron, desoldering pump, desoldering wick, tweezers, pliers, etc.

EXPERIMENT 3 - PCB FABRICATION

Objective

To study the PCB fabrication technique

Materials required

Copper clad board, Driller, Ferric cloride solution, Paint

Method

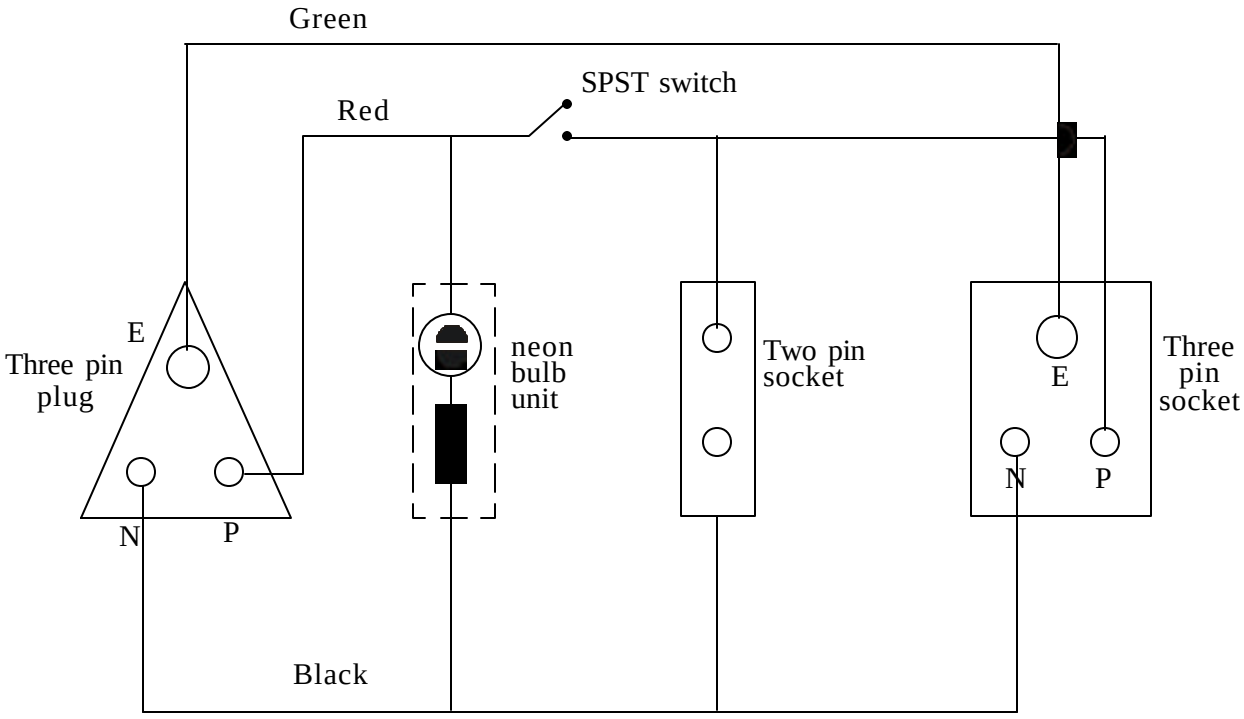
1. Preparation of the layout
2. Transfering the lay out to copper clad
3. Etching to remove the copper from the copper clad wherever it is not required.
4. Drilling hole for component mouting.

EXPERIMENT 4 - FABRICATION OF AN EXTENSION BOARD

Objective

To fabricate an extension board

Diagram



Use three core wire

Mount the above unit in a wooden/plastic box.

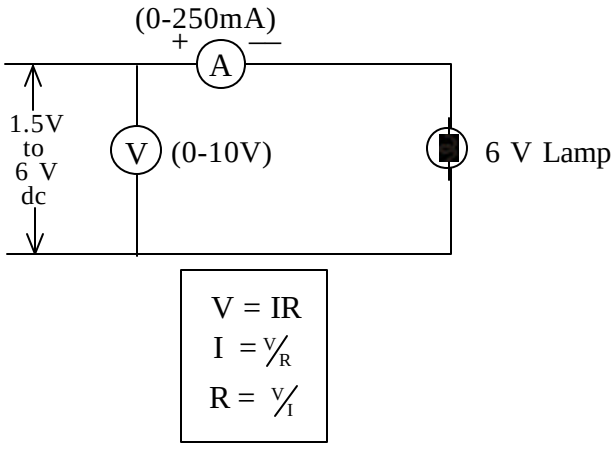
Check the output of both two pin and three pin sockets with multimeter/bulb

UNIT 1

EXPERIMENT 5 - VERIFICATION OF OHM'S LAW

To verify Ohm's law and find the value of unknown resistor.

Circuit Diagram



Connect a 6 V lamp to 6 V variable dc source as in the above circuit. Vary the supply voltage in steps and note the variation in brightness of the bulb. Now students can come to the conclusion that current (I) increases when input dc voltage is increased. At all voltages, note ammeter and voltmeter readings in tabular column shown below and calculate the value of R. We can see that R is always constant.

Observation

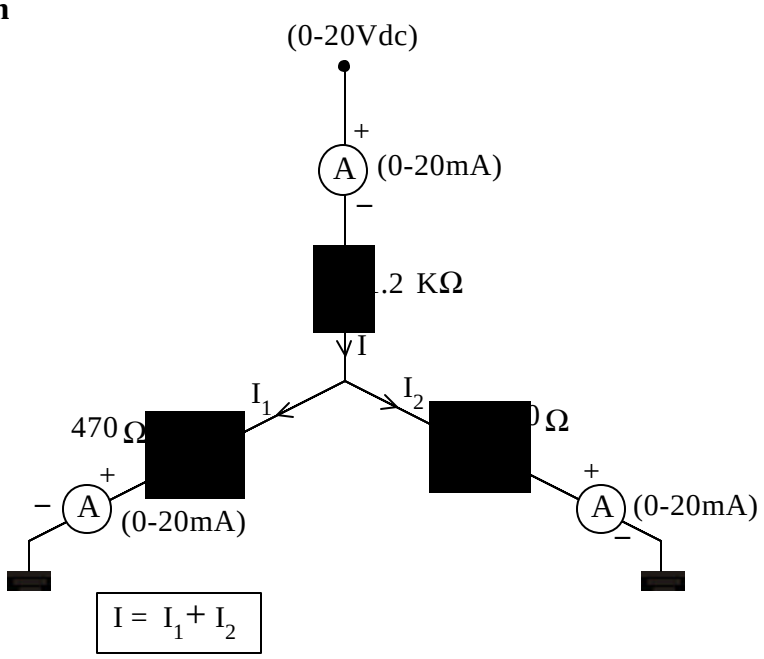
Sl.No.	V (Volts)	I_{mA}	$R=\frac{V}{I}\ \Omega$
1	1.5		
2	3		
3	4.5		
4	6		

EXPERIMENT 6 - VERIFICATION OF KIRCHOFF'S CURRENT LAW

Objective

To verify Kirchoff's current law.

Circuit Diagram



Observation

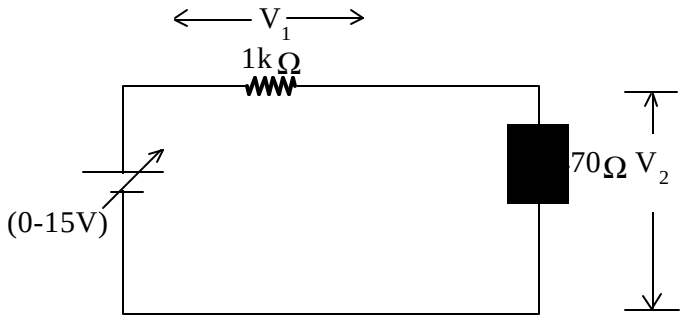
Sl.No.	V (Volts)	I mA	I_1 mA	I_2 mA
1	4			
2	8			
3	12			
4	16			
5	20			

EXPERIMENT 7 - VERIFICATION OF KIRCHOFF'S VOLTAGE LAW

Objective

To verify Kirchoff's voltage law

Circuit Diagram



$V = V_1 + V_2$

$\Sigma V = 0$

Observation

Sl.No.	V in volts	V_1 in volts	V_2 in volts
1	3		
2	6		
3	9		
4	12		
5	15		

UNIT 2

EXPERIMENT 8 - MULTIMETERS

Objective

To familiarize the uses of analog and digital multimeter by measuring different electrical quantities like resistance, voltage and current.

Observation

1. Resistance Measurement (value of given resistors)

Sl.No.	Using Analog Multimeter	Using Digital Multimeter
1		
2		
3		
4		
5		

2. Voltage Measurement

Sl.No.	Particulars	Voltage in volts	
		Analog multimeter	Digital multimeters
1	Dry cell		
2	Given dc supply		
3	AC mains		
4	Given transformer		

Multimeter shows rms values on ac measurements.

3. Current Measurement

Note : While doing Ohm's law or Kirchoff's law verification, use analog or digital Multimeter instead of Ammeter for current measurements.

EXPERIMENT 9 - CATHODE RAY OSCILLOSCOPE

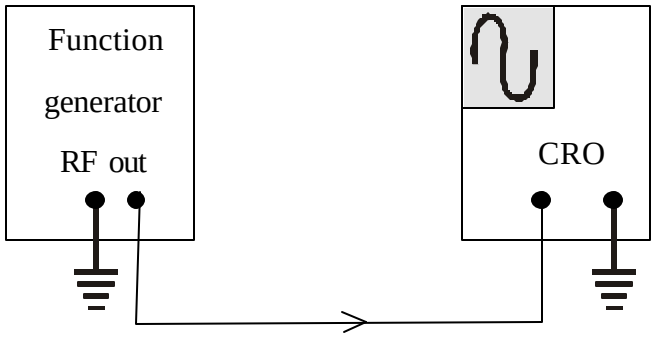
Objective

Observation of AC & DC wave forms on CRO.

Equipments required

CRO, function generator

Set up



Procedure

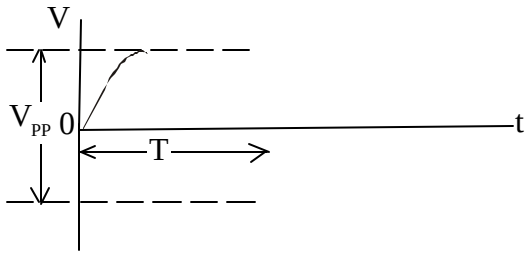
a. To measure the amplitude of an AC signal

1. Switch ON the CRO. Obtain a sharply defined trace of a horizontal line on the screen.
2. Connect the function generator with the CRO using a probe and switch ON the function generator and select sine wave.
3. Observe the wave shape and count the number of divisions occupied by the signal from peak to peak.
4. Multiply this by the scale indicated by Volts/Div knob. This gives the peak to peak amplitude. Half of this is the peak value of the voltage.

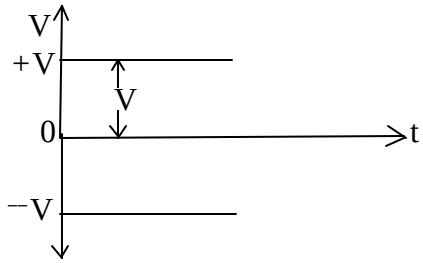
b. To measure the frequency of a signal

1. Adjust the time/div knob so as to see two or three cycles of the waveforms.
2. Count the number of divisions in one cycle of the wave forms. Multiply this by the time-base setting. Note down the magnification factor from MAGN switch. Divide the value obtained by the magnification factor. This is the time period of the signal.
3. Reciprocal of the time period will give the frequency of the signal. $f = \frac{1}{T}$

Repeat the above steps for different wave shapes. (Triangular, square etc.)



Observation of DC



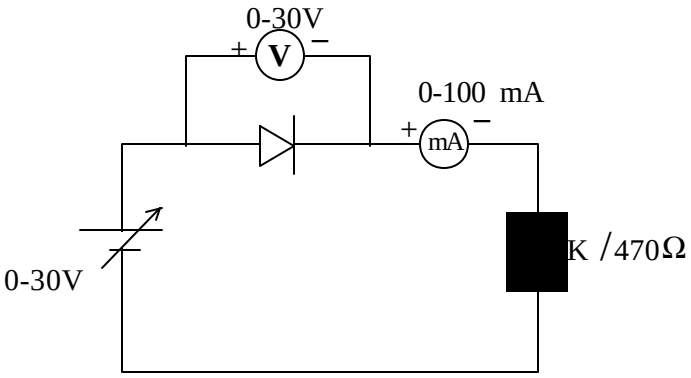
UNIT 3

EXPERIMENT 10. DIODE CHARACTERISTICS

Objective

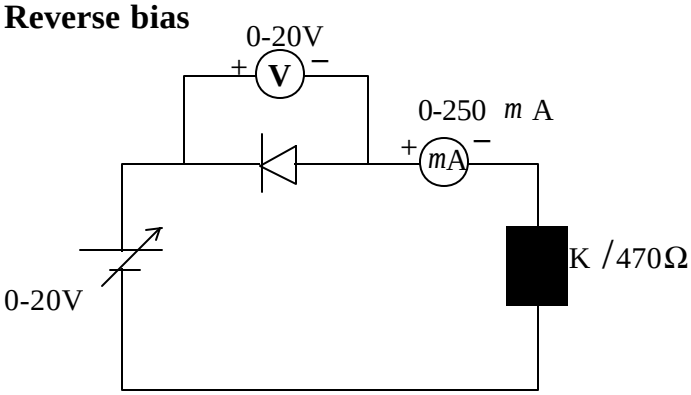
To plot the V-I characteristics of Silicon/Germanium diode.

Forward bias



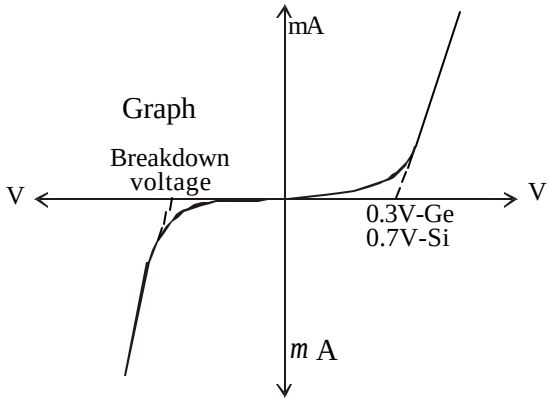
$V_{(v)}$	$I_{(mA)}$

Reverse bias



$V_{(v)}$	I(m A)

Graph



UNIT 4

EXPERIMENT 11-ZENER VOLTAGE REGULATOR

Objective

To analyze the output of a zener diode voltage regulator circuit under varying loads.

Test Equipment

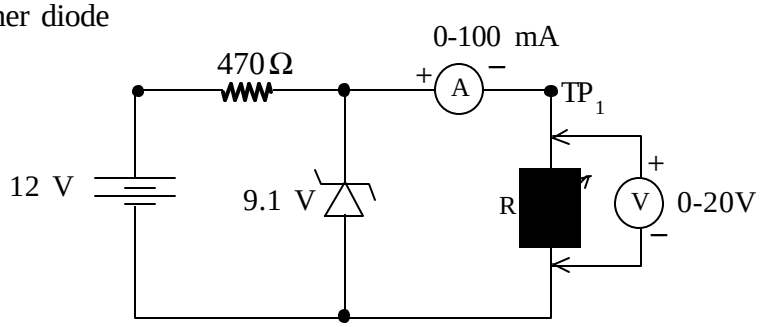
1. Multimeter
2. Oscilloscope
3. 12V power supply

Components

470 Ω resistor

1K Ω potentiometer

9.1V Zener diode



Procedure

Calculate the output current versus output voltage for the circuit in figure as the load varies. Plot a graph of this relation. (plot voltage on the vertical axis).

Using DMM or oscilloscope, monitor the output voltage (with no load) at TP_1 with the input voltage set to 12V. Maintain the input at 12V through out the experiment.

UNIT 5

EXPERIMENT 12 - HALF WAVE RECTIFIER

Objective

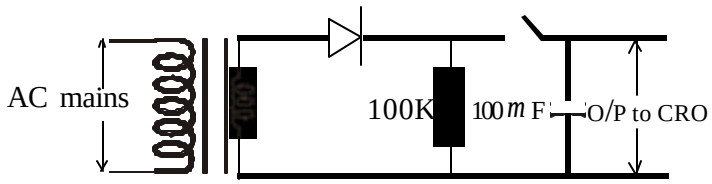
a. To trace the circuit of half wave rectifier with and without filter.

b. To draw the wave shape of electrical signal at the input and output points after observing it in CRO

c. To measure the

   i. AC voltage at the input of rectifier

   ii. DC output voltage with and without filter.



Observation

EXPERIMENT 13 - CENTRE TAPPED FULL WAVE RECTIFIER

Objective

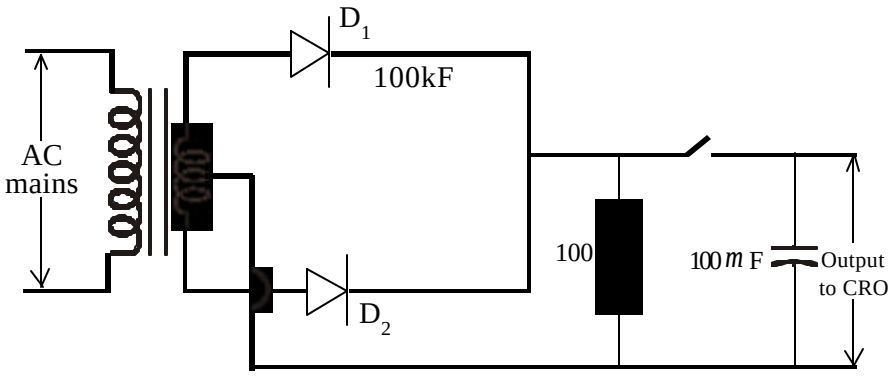
a. To trace the circuit of full wave rectifier

b. To draw the wave shape of electrical signal at the input and output points after observing it in CRO

c. To measure the following voltages

   i. AC voltage at the input of rectifier

   ii. DC voltage at the output with and without filter



Observation

EXPERIMENT 14 - BRIDGE RECTIFIER

Objective

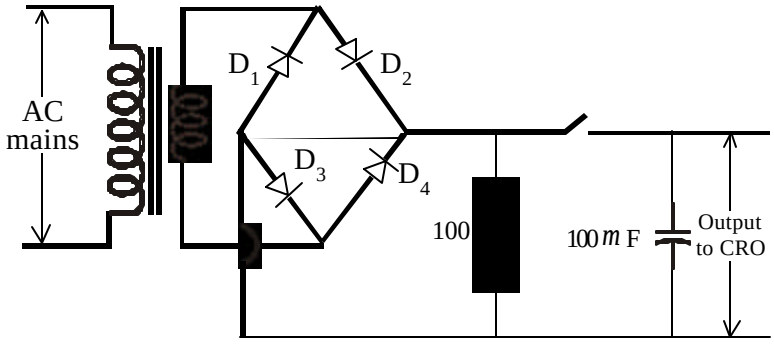
a. To trace the given circuit of bridge rectifier

b. To draw the electrical waveshape at the input and output points after observing it on CRO.

c. To measure the following voltages.

   i. AC voltage at the input of rectifier

   ii. DC voltage at the output with and without filter

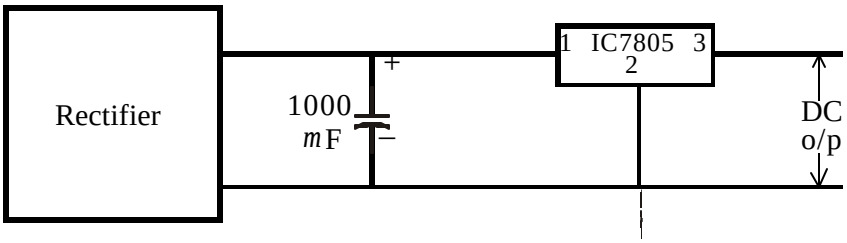


Observation

EXPERIMENT 15 - REGULATED POWER SUPPLY USING IC

Objective

a. To construct a series regulated power supply rated 5V and observe the O/P wave form.

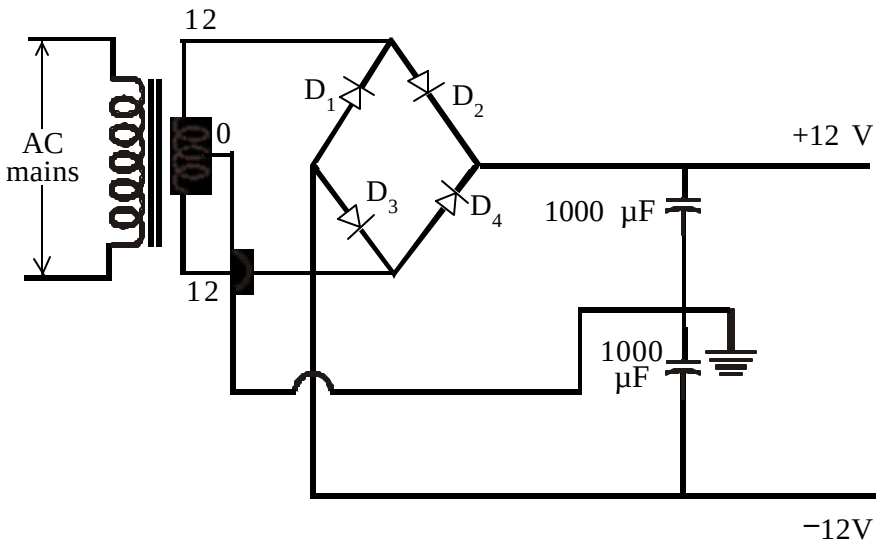


Observations

EXPERIMENT 16 - DUAL POWER SUPPLY

Objective

To construct a dual power supply rated 12 V and observe o/p wave forms.



UNIT 6

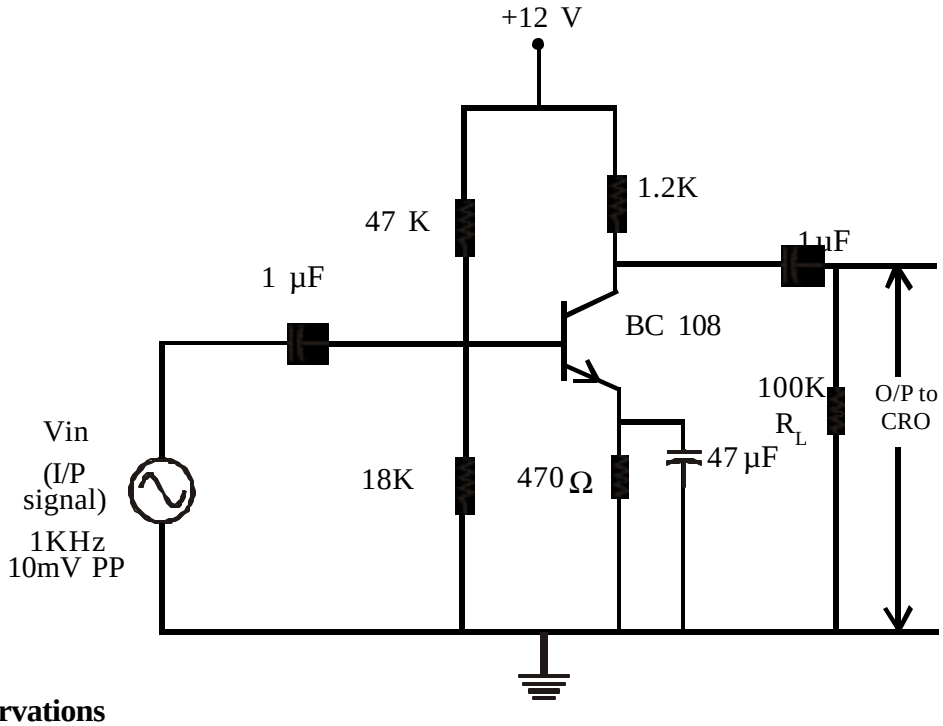
EXPERIMENT 17 - RC COUPLED AMPLIFIER

Objective

a. To set up an RC coupled amplifier using bipolar transistor in CE.

b. To measure the input and o/p voltages.

c. To observe the i/p & o/p wave shapes.



Observations

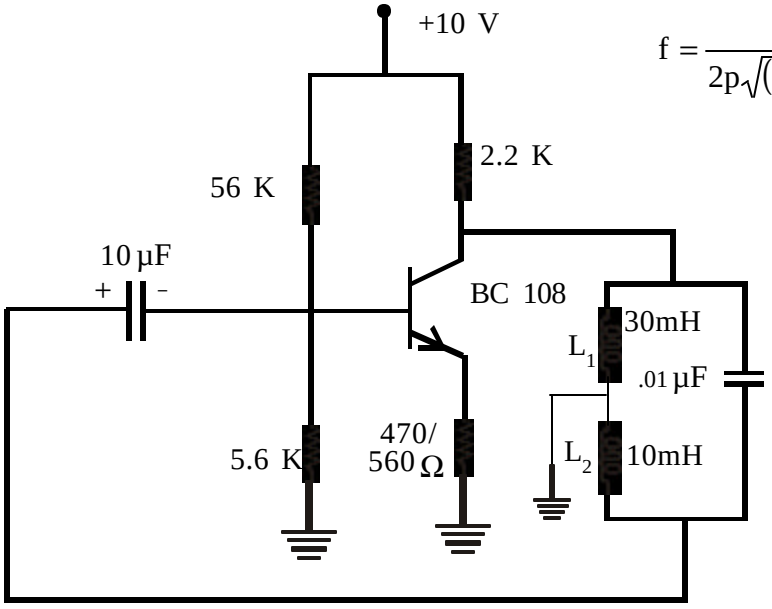
UNIT 7

EXPERIMENT 18 - HARTLEY OSCILLATOR

Objective

a. To set up Hartley Oscillator for a desired frequency.

b. To observe the ouput wave form on CRO

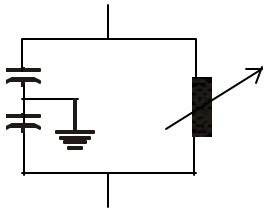


EXPERIMENT 19 - COLLPITT'S OSCILLATOR

Objective

i. To setup collpitts oscillator for a desired frequency

ii. Observe the o/p wave form on CRO.



$$f = \frac{1}{2p\sqrt{L\left(\frac{C_1C_2}{C_1 + C_2}\right)}}$$

EXPERIMENT 20 - RC PHASESHIFT OSCILLATOR

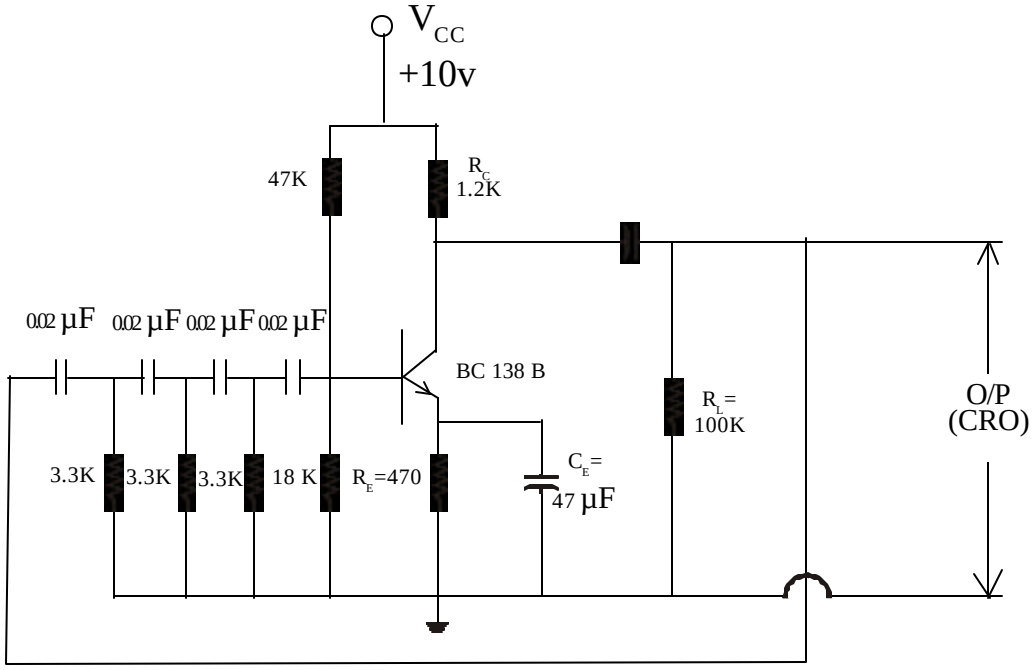
Objective

i. To setup an RC phase shift oscillator using BJT

ii. To observe the output on CRO and plot the same.

Circuit

R1=47Kpot	R_C=2K	R=4.7K
R2=10K	R_E=510 Ω	C=.01 µf
C_C=1 µf		



UNIT 8

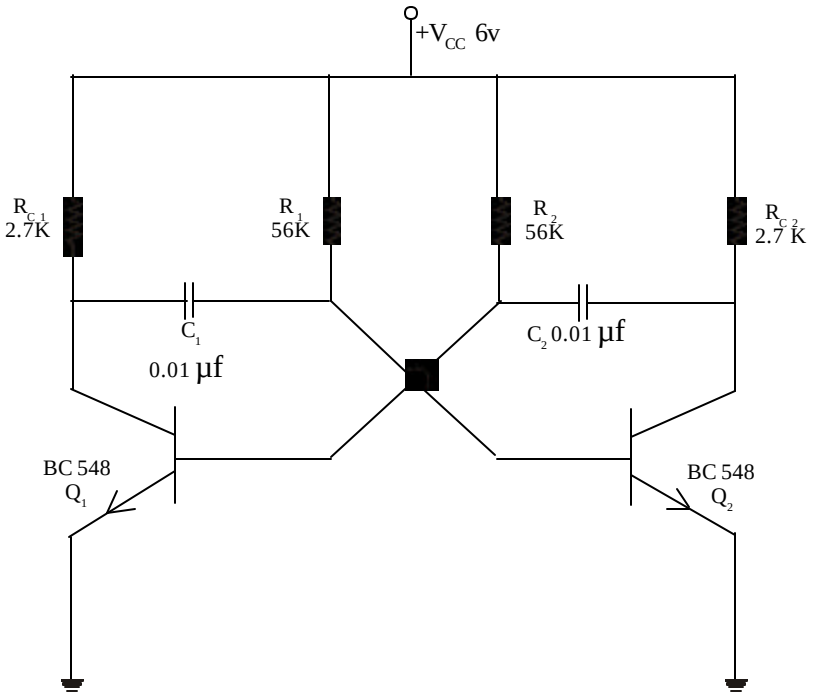
EXPERIMENT 21 - ASTABLE MULTIVIBRATOR

Objective

a. To set up an astable multivibrator using transistors.

b. Observe the output wave form on CRO and plot it.

Circuit



Observations

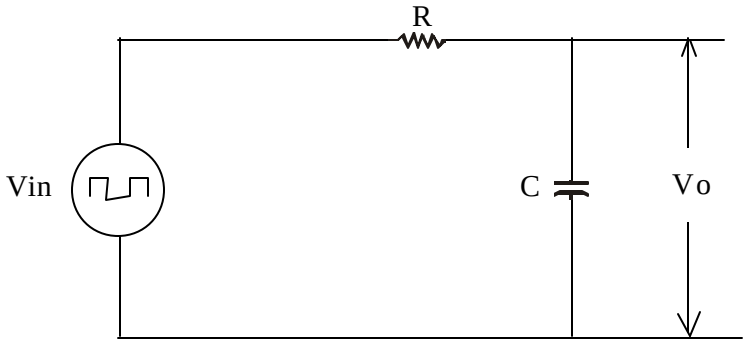
EXPERIMENT 22 - INTEGRATION CIRCUIT

Objective

a. To set up an integrator

b. Observe the output with square wave as input

Circuit



RC>>T

T is the time period of the F/P square wave $T=\frac{1}{f}$

Observations

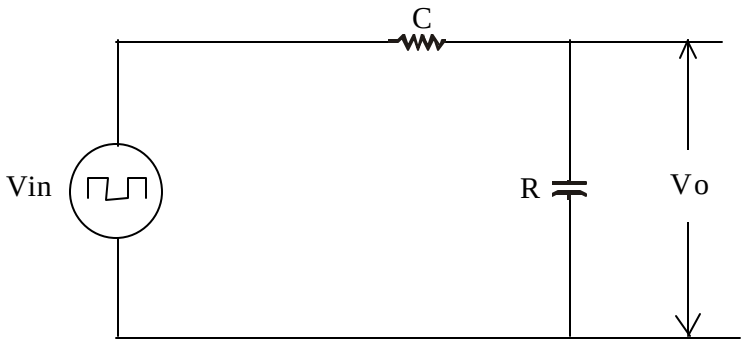
EXPERIMENT 23 - DIFFERENTIATING CIRCUIT

Objective

a. To set up an differentiating circuit

b. Observe the output with square wave as input

Circuit



RC>>t

Observations

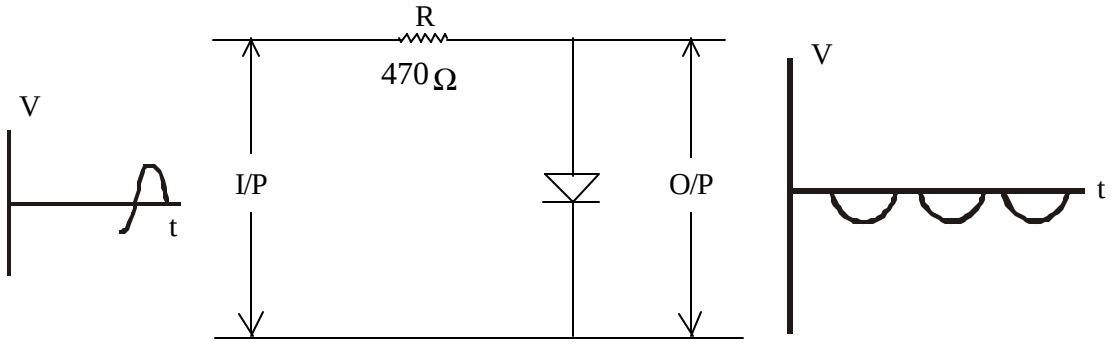
EXPERIMENT 24 - CLIPPER CIRCUIT

Objective

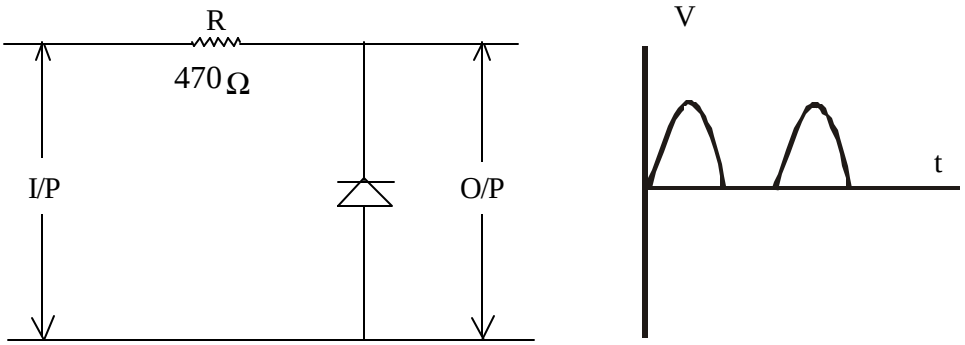
a. To set up a positive clipper and observe the o/p on CRO

b. Set up a negative clipper and observe the o/p on CRO

Circuit [other clipping circuits such as biased clippers can also be give)

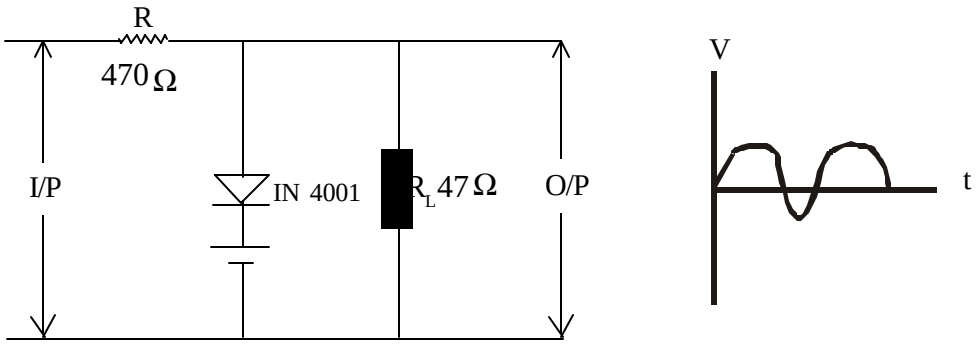


Observations

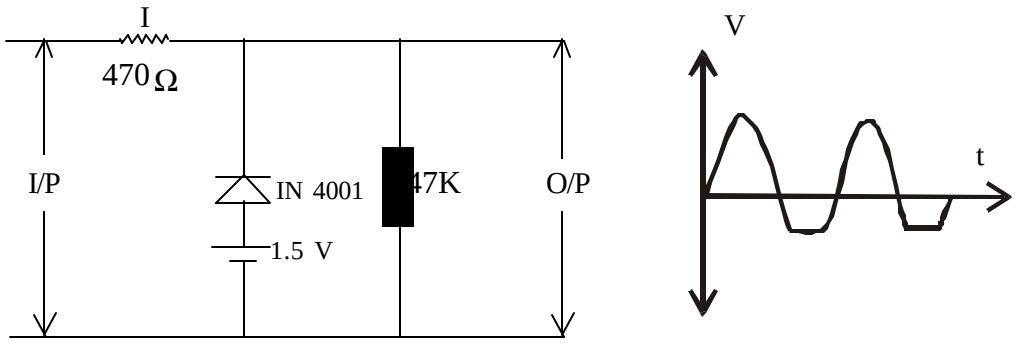


BIASED CLIPPER

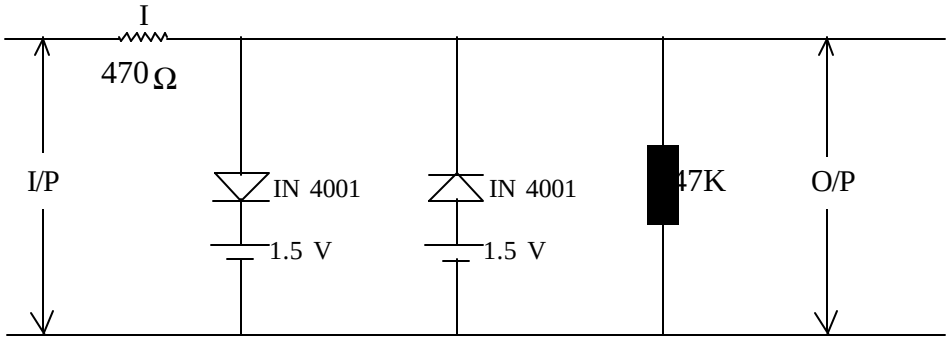
a Positive biased



b. Negative biased



c. Combination clipper



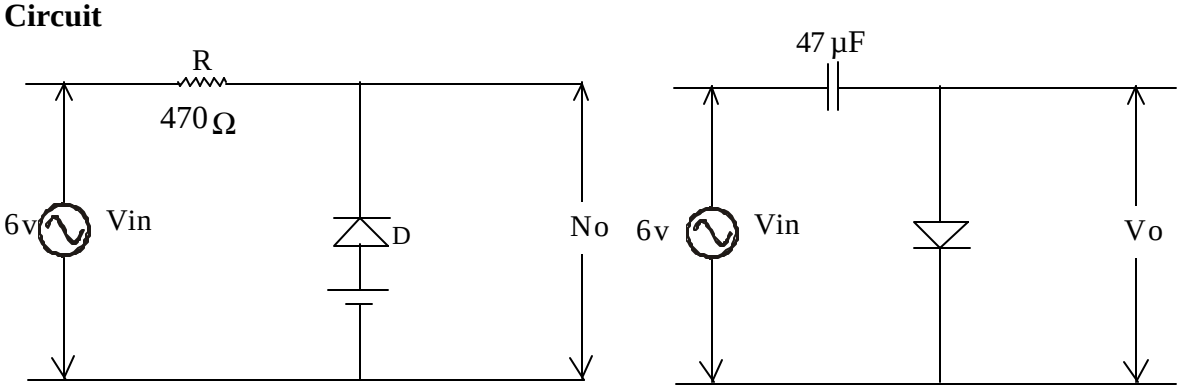
EXPERIMENT 25 - CLAMPER CIRCUITS

Objective

a. To set up a positive clamper and observe the o/p on CRO

b. Set up a negative clamper and observe the o/p on CRO

Circuit



(Based clamping circuits can also be given)

UNIT 9

EXPERIMENT 26 - ANALOG INTEGRATED CIRCUITS

Objective

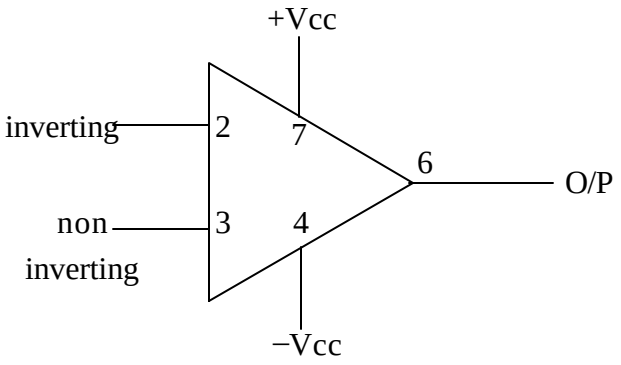
a. To finalize with operational amplifier 741

b. To set up an inverting/Non invertifier using 741

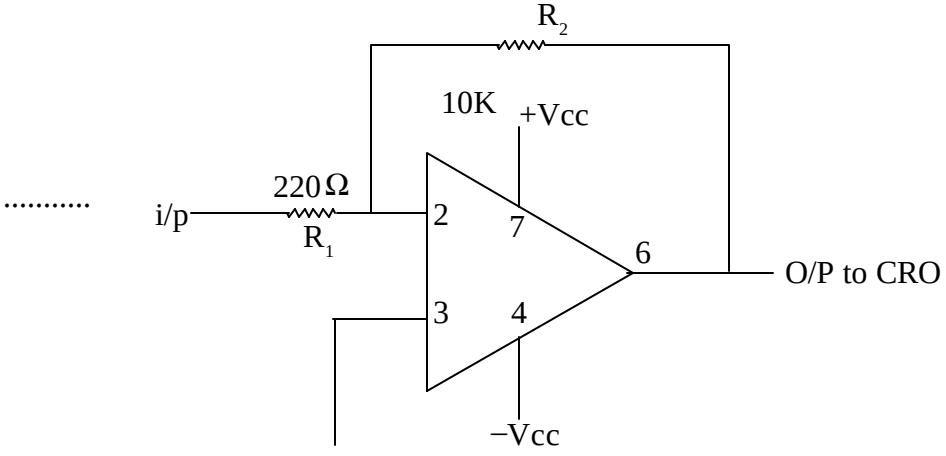
c. Observe both input and output voltage on CRO

+Vcc=12V

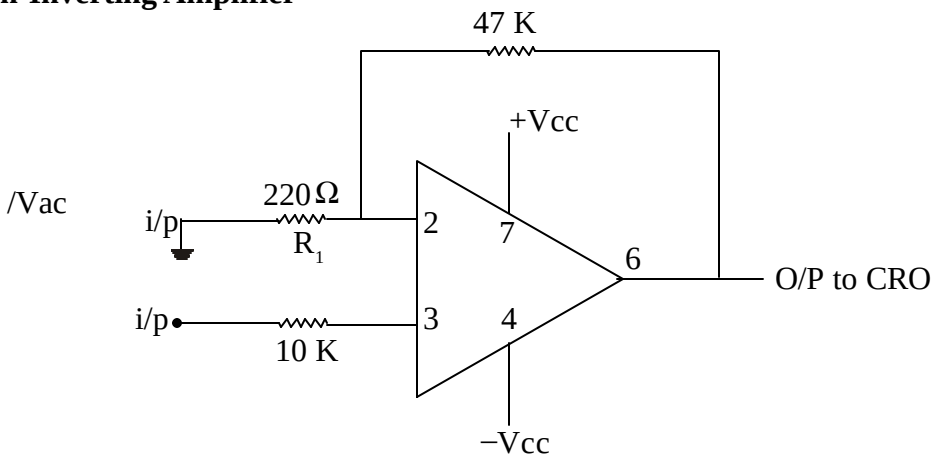
–Vce=12V



Inverting Amplifier



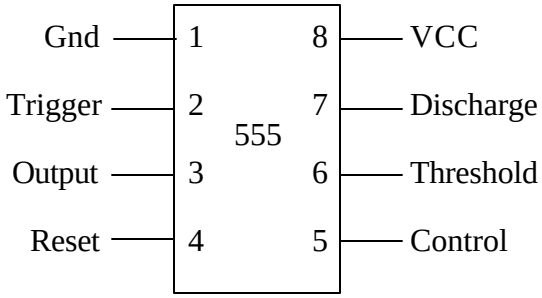
Non-Inverting Amplifier

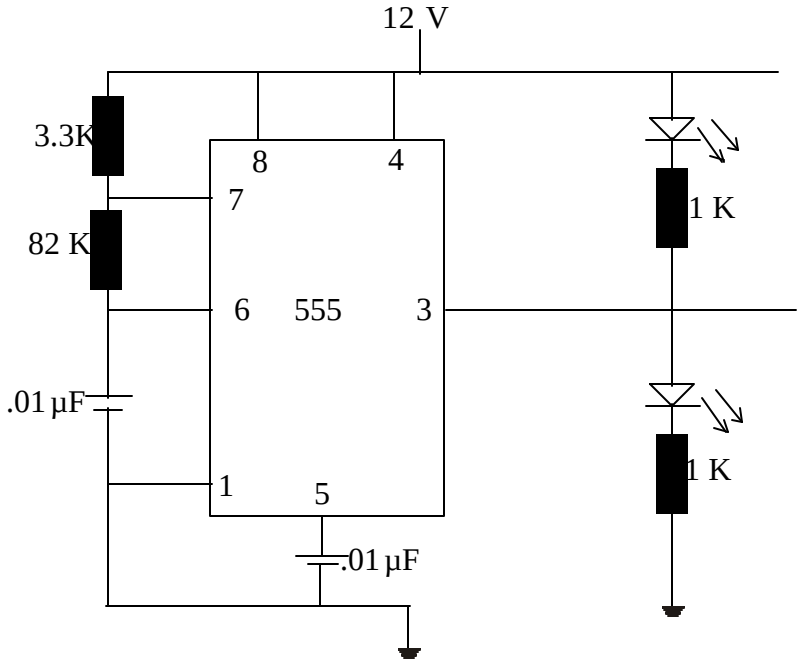


Objective

a. To finalize with IC 555 Timer

b. To set up the circuit of dancing light using IC 555 and L.E.D.



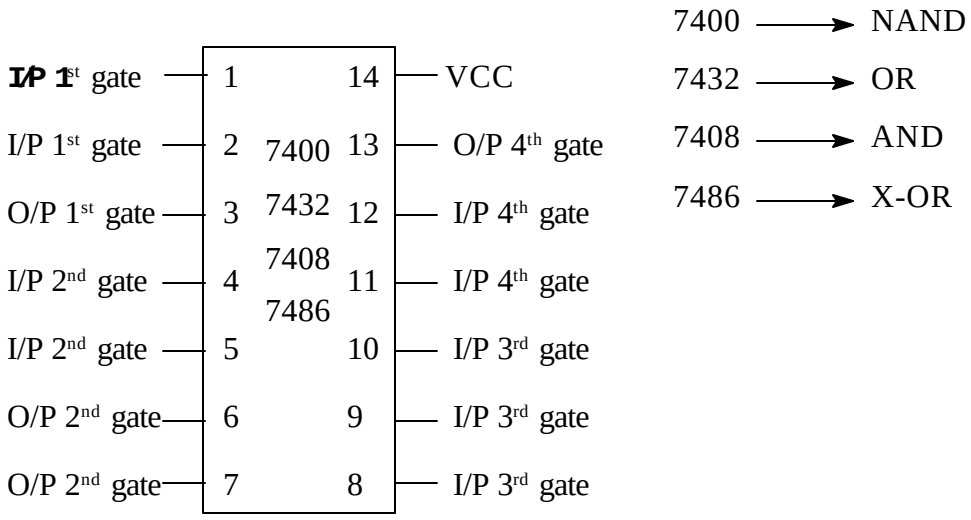


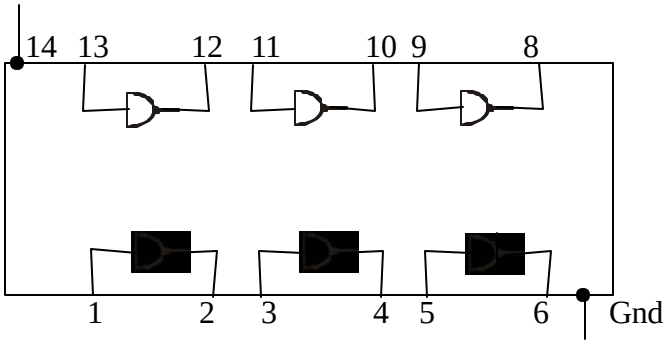
EXPERIMENT 27 - DIGITAL CIRCUITS

Objectives

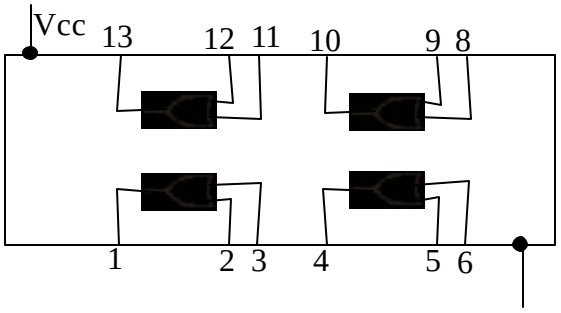
a. To familiarize with logic gate IC packages 74XX series

b. To verify the truth tables of logic gates using 74XX series





7404-NOT gate

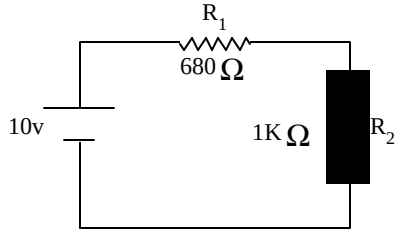


NOR gate

SAMPLE QUESTIONS

I - INTRODUCTION TO ELECTRONICS

1. What is the role of electronics in modern communication systems?
2. How is current related to voltage?
3. Output of a 6V transformers when measured in both ac and dc ranges shows different values. What do they represent?
4. You are supplied with two bults - 40w/230V and 60w/230 V. Which bulb draws more current when connected to the main supply of 230v. Illustrate.
5. Represent 230v/50Hz AC voltage on a graph.
6. Will there be any difference in sound when a 4Ω and 8Ω speaker is connected to the 4Ω jack of a public address system amplifier respectively. Justify your answer.
7. Discuss the property of junction where different currents are met.
8. A closed circuit is given. Discuss the potential difference in each part of the circuit.



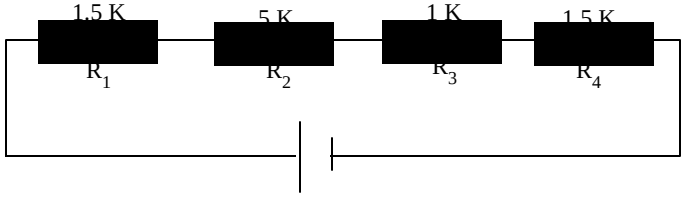
9. Show the graphical representation of AC and DC voltage sources.
10. Two AC signals differ in their phase angle but have the same peak voltage and frequency. Can you graphically represent them.

II - TEST AND MEASURING INSTRUMENTS

1. List out the uses of a digital multimeter.
2. On which measurement does the internal batter of the analog multimeter gets connected across the multimeter leads and with which polarity.
3. How can you check whether the resistance ranges of an analog multimeters are working properly?
4. List out the precautions to be taken while handling a multimeter.
5. Explain how short circuit, open circuit and continuity checks could be carried out by using a multimeter.
6. List out the uses of a function generator.
7. Why output of a 6v transformer when observed on CRO shows 8v?

8. Can you describe the uses of CRO?
9. Explain briefly how the measurements of voltage and frequency can be carried out using a CRO.
10. With a neat block diagram explain the working of CRO.

III - ELECTRONIC COMPONENTS AND DEVICES

1. You are supplied with two 10Ω ¼ watt resistors. Combine these resistors so as to have 5Ω resistance.
2. Write a short note on resistances in parallel?
3. In a series combination of bulbs, if one of them is damaged all of them does not glow. Why?
4. 

   In the above network power discripted across R_4 is 125 mW. Find the battery voltage?
5. Briefly explain the working principle of a transformer.
6. Differentiate between impedance and resistance.
7. What are the roles of a capacitor in an ac circuit and in a dc circuit.
8. Construct a parallel resonance circuit so as to tune 1000 kH_z
9. Compare the properties of inductor and capacitor.
10. '1N 4007'. What are the things can you understand from this?
11. How can you identify leads of a transistor using multimeter?
12. Transistor is a current controlled device. What do you understand from this?
13. In the case of transistor, how majority carries reaches collector from emitter though C-B jn is reverse biased.
14. What happens when capacitors are connected in series and when connected in parallel?
15. What colour code will a carbon film resistor of 6.8 K$\pm$10% bear?
16. Match the colour code with resistance value

1.	Red-red-red-gold	a.	$10\Omega \pm 10\%$
2.	Brown-grey-brown	b.	$47K\Omega \pm 10\%$
3.	Yellow-violet-orange-silver	c.	$180\Omega \pm 20\%$
4.	Brown-black-black-silver	d.	$2200\Omega \pm 5\%$

17. Match the component with type of device.

Component	**Device**
1. SCR	A. Active compound
2. Ferrite core inductor	B. Passive component
3. Diac	

4. Triac
5. Transistor
6. Paper capacitor
7. Diode
8. Vacuum diode
9. Potentiometer
10. Tantalum capacitor

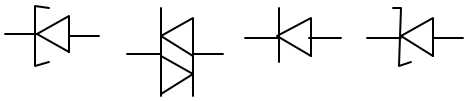
18. How will you foward bias of a P.N.Junction and what happens?
19. One mega ohm reistance is equal to

    a) 100k b) 1000k c) 10000k d) 100000k

20. Inductive reactance of a coil will depend on

    a) frequency of the supply
    b) resistance of the coil
    c) Insulation used in coil wire
    d) Voltage applied to the coil

21. Which symbol represents a zener diode.



UNIT IV - SPECIAL SEMICONDUCTOR DEVICES

1. How can we vary capacitance of a varacter diode.
2. How can FET, SCR, DIAC and TRIAC be checked using a multimeter.
3. FET is a voltage controlled device. Illustrate
4. What do you mean by bicolour and tricolour LEDs.
5. How does an optocoupler isolates two circuits
6. Differentiate between solar cell and conventional cell.
7. What is the role of optical fibre cable in the modern communication system?
8. Draw the pictorial view of a seven segment display.
9. What are the different types of seven segment displays?
10. How ordinary diodes differ from infrared LEDs?
11. Prepare a report on the modern electronic display systems with some examples.
12. List out some of the uses of (i) SCR (ii) UJT (iii) DIAC (iv) TRIAC
13. Name some of the special semiconductor diodes.
14. Compare unipolar and bipolar devices.

UNIT 5 - DC POWER SUPPLIES

1. What is the importance of dc power supply in Electronics fileds.
2. What is the significance of dual power supply in electronic circuit?

3. What is the advantage of SMPS. List out it's applications.
4. Draw the block diagram of SMPS and briefly explain its working principle.
5. What is the need of filter circuits.
6. Name the diode which is used as a voltage regulator. Briefly explain its working.
7. Can you explain the working of a half wave rectifier with diagram.
8. Can you explain the working of a centre tapped full wave rectifier with diagram.
9. Can you explain the working of a bridge rectifier with diagram.

UNIT 6 - AMPLIFIERS

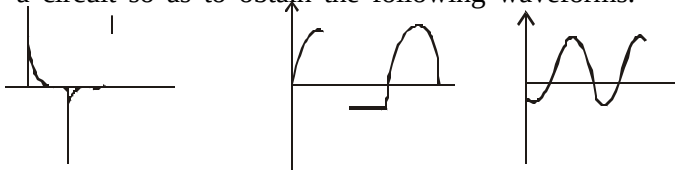
1. Why transformer coupled amplifier preferred in power amplifier stages.
2. Why output stages of T.V/Radio transmitters always operated under class C mode.
3. Which amplifier is used for audio signal is amplification & why?
4. Why frequency response characteristics not uniform in the case of transformer coupled amplifer?
5. Why turned amplifiers are commonly used in IF section of any receiver?
6. How is negative feedback achieved in the case of C.E transistor amplifier?
7. Even though positive feed back increases gain of an amplifier, negative feed back is preferred. Do you agree with this statement? Why?
8. Justify the need of multistage amplifiers for amplifying a signal.
9. With a neat diagram explain the working of a class B power amplifier.
10. What are the differences between a voltage amplifier and a power amplifier.

UNIT VII - OSCILLATORS

1. How oscillations are initiated in R.C phase shift oscillators?
2. Where can you find the applications of oscillators?
3. In any oscillator, what conditions are to be satisfied inorde to start and sustain oscillations?
4. How can the resonant frequency of LC oscillators be varied?
5. Which oscillator is used in radio tansmitter and why?
6. I want a precise frequency oscillator. Which oscillator can I select? Why?
7. Neatly draw the circuit diagram of a Hartley oscillator.
8. Can you state the conditions for oscillation.

UNIT VIII - SWITCHING AND WAVESHAPING CIRCUITS

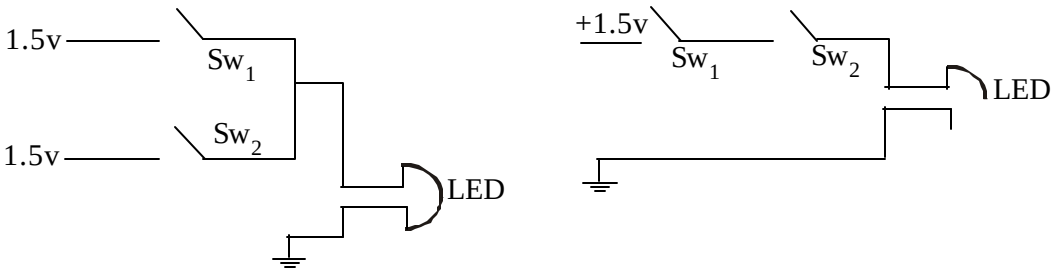
1. How do multivibrator differ from oscillator?
2. Why differentiating and integrating circuits called as high pass and low pass filtes respectively?
3. Draw a circuit so as to obtain the following waveforms.



4. Explain the working of an astable multivibrator with suitable diagram.
5. Draw positive and negative biased clippers and explain their clipping action.

UNIT IX - INTEGRATED CIRCUITS AND DIGITAL TECHNOLOGY

1. $(\quad)_2 = (\quad)_{10}$

   $(\quad)_{10} = (\quad)_2$
2. Draw symbols and truth table of different gates.
3. 

   In the above diagrams, what are the conditions under which LED glows? Realise the circuit using logic gates.
4. What are the applications of flipflops?
5. Differentiate between ICs under 78XX series and 79XX series.
6. What are the applications of A/D converter?
7. What are the applications of D/A converter?
8. Give a brief description about multiplexers and demultiplexers.
9. Have you heard of 'Modem'. What is its application.
10. Compare shift registers and digital counters.
11. List the merits of Integrated Circuits.
12. Name any one analog IC and give its applications.
13. What do you understand by CMOS & TTL.

UNIT X - AUDIO ENGINEERING

1. What is the need of cross ove n/w?
2. Compare woofers and tweetors.
3. What are the advantage of optical recording and reproduction when compare to other systems.
4. How moving coil load speaker generates voice.
5. How do you feel monophony and stereophony. Compare them.
6. What are the modern types of microphones? Explain.
7. How is optical recording carried out?
8. How does magnetic reproduction taken place?

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