I Year - II Semester	ENGLISH –II	L	T	P	C
		4	0	0	3

(Common to All Branches)

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus in primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To imporve the language proficiency of the students in English with emphasis on LSRW skills.

2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theorotical and practical components.

3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronounciation.

2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.

3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.

2. To enable the students to express themselves fluently and accurately in social and professional success.

3. To help the students describe objects, situations and people.

4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students particiapte in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.

2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.

3. To enable the students to skim and scan a text.

4. To enable the students to identify the topic sentence.

5. To enable the students to identify discourse features.

6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.

2. To enable the students to write sentences and paragraphs.

3. To make the students identify and use appropriate vocabulary.

4. To enable the students to narrate and describe.

5. To enable the students capable of note-making.

6. To enable the students to write coherently and cohesively.

7. To make the students to write formal and informal letters.

8. To enable the students to describe graphs using expressions of comparision.

9. To enable the students to write techincal reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.

2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.

3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher interventionis perimitted as per the complexity of the task/exercise.

4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.

5. The teacher is perimitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).

2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the langauge skills learnt in the unit are to be tested.

3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails,letters and reports-- are to be tested along with appropriate langauge and expressions.

4. Examinations:
I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%
(80% for the best of two and 20% for the other)
Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

6.The following text books are recommended for study in I B.Tech II Semester (Common for

all branches)and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 **(R-16 Regulations)**

DETAILED TEXTBOOK : ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

NON-DETAILED TEXT: THE GREAT INDIAN SCIENTISTS Published by **Cenguage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. ' A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he

received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. ' A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and

universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE:

The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

OUTCOME:

The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and sterngthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society’s need to re examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. ' The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. ' Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:
Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:
All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered

MODEL QUESTION PAPER FOR THEORY

PART- I
Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I B.Tech ENGLISH - II

Detailed Text

1. The Greatest Resource -Education

Introduction: Over the centuries, civilisations have flourished, declined and perished. Some failures of resources may have been the cause for civilisations to perish. Therefore it is man but not nature that provides the key factor to all the economic development in all the fields. It is obtained through education. So, education can be termed as the vital of all resources.

Education- the most vital of all resources: Suddenly, there is an outburst of daring invention and constructive activity, in many fields all at once. None can say where it came from but we can see how it strengthens itself- through education.

Education is the key to everything. It also brings many problems. If the advanced technology brings in new problems, such as nuclear age which brings dangers, genetic engineering opens doors to new abuses and commercialism brings new temptations which mean that every- body must become highly educated or perish or will have a steep decline in our lifetime.

Two Cultures and the Scientific Revolution: Lord Snow talked about the two poles of intellectual life-one pole literary intellectuals and the other pole Scientists. He deplores the gulf of mutual incomprehension between scientists and the intellectuals. He thinks and hopes that the gap can be bridged.

Bridging the Gap: According to Lord Snow, the aims of educational policy should be to get as many ‘alpha professionals as the country can throw up’; secondly, to train ‘a much larger stratum of alpha professionals’ to do the supporting research, high class design and development; third, to train ‘thousands upon thousands’ of other scientists and engineers; and finally, to train ‘poloticians, administrators, an entire community, who knew enough science to have a sense of what the real people, the scientists and engineers, are talking about. If we can do this, the ‘gulf of mutual incomprehension’ would be bridged.

Second law of Thermodynamics: Present day education has created uncomfortable feeling that politicians, administrators, engineers etc have failed to know what is going on in the surrounding world. This is compared to second law of Thermodynamics by Lord Snow, which means energy is neither created nor destroyed. This is because the inventions of scientists are neutral. They either enrich the humanity or destroy, which depends on how we use it.

Know-how: Man is thrown into many problems due to scientific and technological progress. It requires something more than what Lord Snow suggests-'Know how'. 'Know how' is the invention of scientists which may be beneficial or harmful, all depends on how we use. We need to analyse if education can help us to make this unfinished sentence to be finished sentence, to turn the potentiality into a reality to the benefit of man.

The Task of Education: The task of education is the transmission of ideas of value, of what to do with our lives. The need to transmit know-how is also important but it should take secondary place. It is foolhardy to place the great powers into the hands of people who have no idea of what to do with them. At present the whole mankind is in mortal danger, not because we are short of scientific and technological know-how but because we tend to use it destructively without wisdom. More education can help us only if it produces more wisdom.

Our Mind, a Tabula Rasa: The essence of education is the transmission values but unless they are a part of us they do not help us. So when we think and feel we think with ideas. Our mind is not a blank, a tabula rasa (a clean slate). When we begin to think, we only think because our mind is filled with all sorts of ideas with which to think. Finally, it is pertinent to note the fact that more education helps us only if it produces more wisdom.

UNIT -2 A Dilemma: A Layman Looks at Science

The lesson 'A Dilemma: A Layman Looks at Science' says that science should be used only for the constructive purposes and not to be aimed at the destruction of the human race. August 6, 1945, an unfortunate day, on which the atomic bomb was dropped on Hiroshima raised apprehensions about the role of science in human life. Mankind is frightened by science and bewildered by its enormous power. This instance has made the mankind to realize how unequipped we are in terms of ethics, law, and government, to know how to use it.

Trouble in mind about science and research

The gifts of science are radio, automobiles, and penicillin etc. Science has recently given us radar, jet propulsion and power sources of unprecedented magnitude. At the same time this same science hands us the means by which we can blow ourselves and our civilization into drifting dust. The research and technology should yield right fruits when they are related to human welfare. Otherwise we may get into trouble and human brain can create things which may go beyond its control.

Scientific dilemma

Science is search for truth and springs from the noblest attribute of the human spirit. But it is the same search that has brought our civilization to the brink of destruction. We are confronted with the tragic irony that when we have been most successful in pushing out the boundaries of knowledge, we have most endangered the possibility of human life on this planet. Science with its discoveries can destroy our own institutions and all the bright hopes of the race. The dilemma of layman is that in such situation if we need to curb science or cling to the pursuit of truth and run the risk of having our society torn to pieces.

One of the scientists who played a leading role in the development of the atomic bomb said to the newspapermen: 'A scientist cannot hold back progress because of fears of what the world will do with his discoveries'. What he apparently implied was the science has no responsibility in the matter, and that it will plunge ahead in the pursuit of truth even if the process leaves the world in dust and ashes.

Evil effects of science and research

The writer strongly feels that research shall be subjected to some kind of restraint if it is not linked to human constructive purpose. Some inventions are purely accidental and the scientists never have any evil intentions while discovering them. For instance Albert Einstein never thought of atomic bomb while working on his transformation equation in 1905. But his work formed the base for the bomb that destroyed Hiroshima. Similarly sulphur drugs and mustard gas, the offshoots of German dye industry were not created to deal with either medicine or weapons of

war. Willard Gibbs was a gentle spirit whose life was spent in his laboratory at Yale university. He had never dreamt that his research in the mathematical physics might have even a remote relationship to World Wars I & II. These discoveries are classic examples where the gifts of science can be used by evil men to do evil even more obviously and dramatically than can be used by men of goodwill to do good.

Conclusion

The author concludes that the towering enemy of mankind is not science but war. Science merely reflects the social forces by which it is surrounded. When there is peace, science is constructive and when there is war, science is perverted to destructive ends. Our problem therefore is not to curb science but to stop war- to substitute law for force and international government for anarchy in the relations of one nation with another. He feels that our education should be based on tolerance understanding and creative intelligence that should run fast enough to put an end to the evil effects of the science. Thus, human beings are accountable in making use of science and technology for productive purposes.

UNIT – 3 Cultural Shock: Adjustment to new cultural environments

Introduction: Culture shock is a state of anxiety and frustration resulting from the immersion in a culture distinctly different from one's own. The difficulty to adjust to a new culture is caused by the inability to understand, interpret, or translate new patterns of cultural behaviour, symbols, and expressions present in the new social setting. The loss of references, the absence of familiar cues and symbols can lead to identity conflict, disorientation, cultural misunderstandings, interpersonal conflict, and feelings of powerlessness. Culture shock is more intense when the values, beliefs, customs and behaviour of the new culture differ or are perceived as different from one's own. Ignorance or lack of familiarity with foreign contexts, unrealistic expectations or strong identification or affiliation with one's

own culture can make the process of adaptation to the new culture more difficult. Other aspects that influence how a person is affected by culture shock and how fast he or she can overcome it, include personal attitudes and traits and social, interpersonal, and communication skills.

Phases: They first reject the environment which makes them uncomfortable. Another phase of culture shock is regression where one forgets all difficulties and remembers only the good things. It usually takes a trip home to bring one back to reality.

The Four Stages of Culture Shock:

Honeymoon Phase

The honeymoon phase coincides with the arrival in a new country and the first period of contact with a new culture. This phase is usually brief, it may last a few days or weeks**.** During the honeymoon phase, the traveller is fascinated with the sights, sounds, and tastes of the new culture. Things are seen as new, different, and interesting and the whole experience is lived as an exhilarating event, often accompanied by a sense of unreality. In this phase similarities between cultures stand out, differences are minimized and romanticized and negative events are ignored.

Crisis Phase

In the crisis phase the sojourner's negative perception of the host culture and its differences is enhanced. The crisis arises as a result of puzzling encounters and interactions. The traveller begins to experience real and seemingly irresolvable problems. Difficulty in managing communication and common daily activities such as shopping or transportation contribute to feelings of frustration, hostility, stress, and anxiety. Consequently, the individual tends to alienate and withdraw from the host culture. This phase varies in duration, the length of this period is determined by one's ability and motivation to start integrating into the host culture.

Recovery Phase

During the recovery phase, the visitor learns how to function in the new culture and be independent. Confidence is slowly restored and competency increases as a result of new learned social behaviour. In this way the individual starts to acquire and assimilate culturally relevant and appropriate ways to interact and communicate. He or she develops appropriate problem solving skills and conflict resolution mechanisms. As a result of increased confidence and familiarity with the host environment, cultural perception of the foreign culture also starts to change

Adjustment Phase

During this phase the individual starts to adapt to the new culture, embrace its differences and accept what it has to offer. This phase is marked by low anxiety and the increased ability of the traveller to interact successfully with members of the host culture and build social relationships. This phase also brings a sense of satisfaction, accomplishment, and personal growth for having overcome culture shock.

- **Symptoms of Culture Shock:**

1. Feeling very angry over minor inconveniences
2. Irritability
3. Withdrawal from people who are different from you
4. Extreme homesickness
5. Sudden intense feeling of loyalty to own culture
6. Overeating or loss of appetite
7. Boredom
8. A need for excessive sleep
9. Headache
10. Upset stomach
11. Small pains really hurt
12. Depression
13. Loss of ability to work or study effectively
14. Unexplainable crying
15. Marital or relationship stress
16. Exaggerated cleanliness
17. Feeling sick much of the time

UNIT - 4 THE LOTTERY

INTRODUCTION

The Lottery" is a short story written by Shirley Jackson. The story describes the ritual called 'The Lottery' that was observed in many places in America. The story began on 27 Th June. It was a one day lottery draw as the population of the town was only two hundred. The Heads of families, women and children gathered every year in summer at the square, between the post office and the bank. Mr Summers, round faced jovial man carried out the Halloween program. He seemed to have the control of the entire proceedings as everyone on the square was eagerly waiting for his arrival.

CHARACTERS INVOLVED AT THE SQUARE

The school was closed recently for the summer .The boys Bobby Martin, Harry Jones, Dickey Delacroix, Baxter, Bill, Junior Little Dave and the girls Nancy and Tessie gathered various sized stones and prepared the heaps of them. Mr Summers, the man who had energy to devote for civic activities arrived along with the postmaster Mr Graves to the square. The participants in group were Mrs Hutchinson, Mrs Dunbar, Mrs Graves Steve, old man Warner, Allen, Mrs.Delacrox, Janey and others.

PURPOSE AND SEQUENTIAL PROCEEDINGS OF THE LOTTERY

The original paraphernalia for the lottery changed slowly with times. The black colour of the lottery box represented significance and it was not replaced though it grew shabbier and was splintered badly along one side and stained. Mr Summers was successful in replacing the chips of wood which were used as lots with slips of paper. The night before the lottery Mr Summers and Mr Graves made up the slips of the paper and put them in the box. It was taken to the safe of Mr Summers Coal Company and locked up until Mr Summers was ready to take them to square. The rest of the year the box was kept in different places.

There was some ceremonial procedure before the lottery was declared open. Lists were made for members of each family. There was swearing ceremony many years back followed by ritual of some sort –tuneless chant, which was replaced by

walking among the members singing and all this was reduced with time. An official speech was made by Mr Summers and the lottery was declared open. One by one took the lots. If the household head wasn't present , his grown up son or daughter could take the lot.

Everyone was eager and tense to know who the winner of the lottery was. It was won by Hutchinson family. Mrs Hutchinson accused it wasn't fairly done. Ignoring her protests, the members of the Hutchinson household were made to draw the lottery to decide the exact winner. Even after taking the sip of paper, Mrs.Hutchinson was reluctant to open her slip. Bill went over to his wife and forced to open the slip of paper out of her hand. It had a black spot which was made by Summers night before with a charcoal pencil. Thus Mrs. Tessie Hutchinson was the winner of the lottery.

Act of "It isn't fair"/conclusion:

The children were ready with stones heaps of different sizes and even the elders picked them up to throw at the person who got the black mark. Tessie was already at the centre of the square. Mrs Hutchinson kept screaming that it was not fair. But no one bothered to hear her and the sad collective act of murder took place. Thus, Shirley Jackson, the author trivialised the grave practice of the community traditional stoning.

UNIT -5 The Health threats of Climate change

Increased Exposure to Extremes of Heat and Cold: Temperature shows adverse impacts on health. Low fever or High fevers are long recognized deaths of extreme temperature. Scientists recorded that these are because of global warming. Hundreds of deaths are associated with 1995 heat wave in Chicago and thousands of excess deaths in Europe in 2003 which stirred the governments and public health agencies to take protective steps.

Altered patterns of infectious disease: A large number of infectious diseases cause deaths in the United States. These kinds of vector borne diseases like Malaria, Dengue fever, Yellow fever and West Nile fever are the results of climate changes.

Worsening Allergic Disease (Asthma and Hay fever): The two principle diseases associated with aero allergens are allergic irritation referred to as hay fever and asthma. The changes in the climate increase the risk with asthma and hay fever because of altered local and regional pollen production. More prolonged and intense exposure to aero allergens could result in more severe diseases, greater morbidity and even mortality from asthma.

Increased risk of morbidity & premature mortality: Climate change could worsen air pollution either directly, through increased troposphere ozone production or indirectly, through greater power plant emissions. The anticipated changes could take decades. At the same time, there is a chance to increase motor vehicles usage and power plant usage in low and middle countries. As a result, petroleum supplies lessen and fuel prices might be increased. Ozone is a secondary pollutant; its pollution is projected and increased by warmer temperatures. Fossil fuel burning contaminates the atmosphere with primary particles produced by combustion and secondary particles formed gaseous emissions components, both ozone and airborne particles with premature mortality and adverse health.

Indirect consequences: Changes in the climate could threaten water safety, food security and supply, leading to dehydration, disease and malnutrition. Competitions for reducing resources and forced migration in the face of climate change could spark them. General and economic disruption could affect the stability and actions of governments which impact medical and public health services**.**

Adoptive measures in place: There are different approaches taken to protect and improve the communities' health. They say that prevention is the fundamental step. In the USA, public health care measures are already established. Though there are many measures taken, we need to be more sensitive to particular issues of climate change and health, i.e. particularly related to heat waves and infectious disease.

Public health surveillance-a foundation tool: surveillance is one of the fundamental tools for identifying and mitigating public health problems. It also collects data, receives finding and it also takes necessary steps when needed. In the United States, the centers for disease control and prevention have an increasingly broad set of surveillance activities in place. Analytic tools have also been developed to know the consequences of climate change or the other factors. WHO plays a vital role in surveillance at the global level, interacting extensively with United States and other organizations.

Dealing with heat: Temperature Warning Systems and Air Conditioning: Many epidemics of heat caused deaths have been identified. For this, different

types of tools are available in USA to measure the heat which leads to dangerous heat stream and which also is an indication of signal streamer. Heat watch systems have been implemented and proven effective.

Kalkstein and colleagues, in an article in International Journal of Climatology established one model based on identifying the weather conditions historically associated with increased mortality in a particular location. The approach uses exploratory and clustering statically methods to identify synoptive conditions 'oppressive air masses' .This leads to increased mortality. This is a paper which describes the approach and suggests that implementation of this type of system may have reduced the impact of heat wave in Philadelphia during the summer of 1995. Use of air conditioning can lessen the impact of heat waves although the strategy involves associated costs of implementation and the electric power to support airconditioning.

Air Quality Monitoring & Management: To control the air pollution and its levels, many countries including USA adapted extensive air quality management program. This is used to improve the air quality. However, even at present level in many countries, air pollution poses a continued threat. Data is available to trace pollution trends through time trend analysis which will probably be insufficiently sensitive for identical of the specific contribution of climate change given the many control levels to urban air pollution.

In the USA and many countries of Europe, levels of major urban and regional air pollutants have dropped and show that quality management strategies can be more effective. In the longer run, the struggles may not be effective as there will be changes in the powering of motor vehicles.

Clinical Care: Medical case is a further learning factor for adverse impact of climatic changes on health. Effective treatment plans are available for heat stress, allergic diseases, and infection diseases. One more role for clinical care is to recognize the occurrence of sentinel cases that signal a possible outbreak or an emerging illness. The first case of AIDS was recognized in 1981 by the clinicians.

Conclusions-Preparing for adaptation:

The 2009 reports of University College London Institute for Global Health commission and the World Health Organization calls for immediate actions in the face of looming public health crises. All have to agree that there should be "Primary Prevention" i.e. slowing climate change as quickly as possible. At the natural levels, the projected rises of climate change should motivate countries to extreme data system and improve preparation for frequent and disastrous weather

events. However, it may be more difficult to motivate action at different levels, where the threat of climate change may appear remote, particularly when viewed in the context of Primary local issues.

Much has been written on adaptation to climate change. For example, European Union funded a project "Climate Change adaptation strategies for Human Health" to systematically assess the adaptation strategies for Europe. Risk assessment methods, including burden of disease estimation, will central as a tool for estimating the need for implementation of adaptive strategies and quantifying their benefits. At the national level, the government should assure it has clear designated a locus, so that, adaptation strategies will be more effective. If this monitoring system fails, the process should be uncertain.

Unit -6 THE CHIEF SOFTWARE ARCHITECT

Introduction: Bill Gates is an American business magnate, investor, author, and philanthropist. In 1975, Gates and Paul Allen co-founded Microsoft, which became the world's largest PC software company. During his career at Microsoft, Gates held the positions of chairman, CEO and chief software architect and was the largest individual shareholder until May 2014. Gates has authored and co-authored several books.

Early life and education: Gates was born in Seattle, Washington on October 28, 1955. He is the son of William Henry Gates III and Mary Maxwell Gates. His father was a prominent lawyer and his mother was a student of the University of Washington and was actively involved in student affairs and leadership. Bill Gates grew up in upper middle class family with two sisters, Kristianne and Libby. The Gates family atmosphere was warm and close and all the three children were encouraged to be competitive and strive for excellence. He had a very close relationship with his mother, Mary, who after a brief career as a teacher devoted her time to helping raise the children and working on civic affairs and charities. She would often take Bill along on her volunteer work in school and community organizations.

Bill was a voracious reader as a child, spending many hours poring over reference books such as the encyclopedia. Gates began to show interest in computer programming at the age of 13 at Lakeside School. He blossomed in nearly all his

subjects, excelling in Maths, Science, English and drama. A Seattle Computer Company offered to provide computer time for students in the school. Gates became entranced with what a computer could do and spent much of his free time working on terminals. He wrote a tic-tac-toe program in BASIC computer language that allowed users to play against the computer.

Gates graduated from Lakeside and secured 1590 out of 1600 on the college SAT test. He enrolled at Harvard University to pursue Law. Though he spent more of his time in the computer lab than in class, he passed in his exams with a reasonable grade.

Early Career: in 1970, Bill Gates and his friend Paul Allen developed "Traf- o-Data," a computer program that monitored traffic patterns in Seattle and earned $20,000 for their effort. Gates and Allen wanted to start their own company. Allen showed Gates an edition of popular Electronic magazine featuring an article on the Altair 8800 minicomputer kit. Altair was made by a small company called Micro Instrumentation and Telemetry System (MITS). Gates and Allen contacted the company and gave a demonstration on a BASIC software .Allen was hired at MITS and Gates also joined him.

Microsoft World: Gates and Allen formed a partnership they called Microsoft, a blend of "Micro- Computer" and "software". Microsoft wrote software in different formats for other companies. With his perception for software development and a keen business sense, Gates was placed as the head of Microsoft, which grossed $ 2.5 million in 1978. Gates was only 23 years old at that time.

As the computer industry began to grow with companies like Apple, Intel and IBM developing hardware and components, Bill was continuously out on the road advertizing the merit of Microsoft software applications. In November 1980, IBM was looking for software that would operate their upcoming personal computers (PC) and approached Microsoft. Gates quickly impressed IBM. He bought basic operating system to work for the IBM PC. Microsoft growth exploded and staff increased from 25 to 128. Revenue also shot up from $ 4 million to $16 million. Gates was appointed as president and chairman of the Board. In 1991, Microsoft started focusing on windows and NT Kernel. Microsoft's Internet Explorer web browser displaced Netscape's Navigator.

As the architect of Microsoft's product strategy Gates has aggressively broadened the company's range of products. Through technological innovation, keen business strategy and aggressive business tactics, he built the world's largest software business, Microsoft and became one of the richest men in the world.

I B.Tech SEM- II Non Detailed Text

UNIT – 1 A.P.J. Abdul Kalam: A Brief Biography

Abdul Kalam, a Missile Man of India: A.P.J. Abdul Kalam is popularly and affectionately known as 'the Missile Man of India'. This epithet sums up his immense contribution to the development of missile technology in India. He led several successful testings of missiles and their subsequent inclusion in the Indian military arsenal.

Family Background: Avul Pakir Jainulabdeen Abdul Kalam was born on 15th October 1931 in Rameswaram, a small holy town in Tamil Nadu, to Jainulabdeen and Ashiamma. He was the youngest of four brothers and one sister. Kalam attributes his value system to his parents.

Childhood-Difficulties Faced: Kalam began the journey of his life under tough circumstances. Indeed, as a young boy Kalam faced a lot of hardships as he had to support his family who earned meagre income. When he was a 10-year old kid, his daily routine followed a strict regime. He used to wake up at 4 am. After taking bath, he would go to study mathematics from a very competent teacher, Mr Swamiyar. After that, his father would take him for namaz and then to an Arabic school for learning the holy Koran Sharif. Later, he would go to the Rameswaram railway station to collect newspaper to be sold in the town during the day to earn extra money for his family, besides trying to do well in his studies too.

Values Learnt at St .Joseph's College: At the age of 15, Kalam joined the Schwartz high school. This was the turning point in his student life. Mr. Solomon, a teacher motivated him never to get disappointed by failures. Kalam was one of his most favourite students and had a lasting impression of the teacher. After the schooling, Kalam joined Joseph's college in Tiruchirapalli and spent four years

there. As he had to share the room of his dormitory with two other students of different faiths, Kalam learnt the importance of religious freedom and harmony.

Project at MIT: Though Kalam obtained his degree in physics, in his childhood he was fascinated by the flight of birds. His 5th class teacher Mr. Iyer took him to the beach and showed the flight of birds that helped him decide his future course as career. The project at MIT in the third year involved, from Kalam's side, integration of the individual work towards a holistic project objective. The teamwork taught him the importance of time and time management.

Kalam was rejected at Indian Air Force due to some shortcomings. Tenacious as he was, he returned and got a position at the Directorate of Technical and Development and Production at Delhi. Subsequently, he was posted to Aeronautical Development Establishment in Bangalore.

Objective of Training: In 1963, TERLS nominated Kalam to go to the USA for a six-month training programme on sounding rockets and launching techniques at the National Aeronautics and Space Administration. The most important lesson that Kalam learned apart from the technology aspects was the importance and close correlation between scientific research and technology development. He also learned the art of objectivity-each action and decision had to be aligned to an objective.

On 15 August 1969, Indian Space Research Organisation (ISRO) was established under the Department of Atomic Energy, headed by Vikram Sarabhai. Following the untimely death of Homi Bhabha in an airplane crash, Kalam was selected to lead Satellite Launch Vehicle (SLV) Project under the ISRO. Kalam had a great rapport with the government too and this helped him in getting faster approvals and implementation of the projects. Thus, he was entrusted with the prestigious SLV III as well as SLV IV projects.

SLV-3: This project proved to be a turning point in the history of the Indian space programme. That single success changed perceptions, both within and outside ISRO, about what Indian Space and Technology could do. The objective was to develop a reliable launch vehicle for a 40 kg satellite in a 400 km circular orbit around the earth. It was a big boost and validated the elaborate technology management system that had been set up for the project. It was a confirmation of the whole set up that the engineers of the project and Satish Dhawan, Brahma Prakash and Kalam had created towards the success of the projects.

IGMDP(Integrated Guided Missile Development Programme): Kalam turned a new leaf in his 20 years of dedicated services for the space mission, first at Thumba and then at ISRO by joining DRDO as Director of the Defence Research and Development Laboratory at Hyderabad on 1st June 1982. He was also entrusted with an integrated Guided Missile Development Programme (IGMDP). Along with V.S. Arunachalam, the then scientific advisor to the Government of India, he envisaged to build a quiver of five guided missiles -Prithvi, Trishul, Akash, Nag and Agni.

Political Life of Kalam: In July 1992, Kalam was appointed the Chief Advisor to the DRDO, a post which he held till December 1999. In 2002, Kalam became the 11th President of India. The events that unfolded in the Indian political scene before his nomination by the ruling NDA was nothing less than a television soap. Kalam's name was not in the contender's list but the then Prime Minister Sri Atal Bihari Vajpayee, sensing the delicate situation of his mandate, decided to offer the presidency to Kalam. The choice was that of India's most credible scientist, an honest man and from religious minority community such that even the Indian National Congress which was the main opposition came to the support of his candidature.

Pokhran-II: During the period when Kalam was the Chief Scientific Adviser to the Prime Minister and the Secretary of DRDO, the Pokharan-II nuclear tests were conducted. He served as the Chief Project Coordinator, along with Rajagopala Chidambaram, during the testing phase.

Kalam-Dr. Somaraju Combo: Kalam with Dr. Somaraju developed an economical stent called 'Kalam- Raju stent' to work on a variety of medical products that help improve medical facilities and lessen health costs for the poor.

Controversies Faced: Kalam was also mired in controversy for doing nothing on the twenty odd clemency petitions that were pending with him from various convicts across the country. He was also criticised for signing office of profit bill.

Life after Presidentship: After his tenure as president, he became a visiting professor at the IIM, Ahmedabad, IIM, Indore; an honorary fellow of Indian Institute of Science, Bangalore, Chancellor of the Indian Institute of Space Science and Technology, Thiruvananthapuram; professor of Aerospace Engineering at Anna University and an adjunct at many other academic and research institutions

across India. He taught information technology at the IIIT Hyderabad, and technology at Banaras Hindu University and Anna University.

Awards Kalam Won: IEEE Honorary Membership-2011, King Charles Medal -2007, Honorary doctorate of science – 2007, Ramanujan award –2000, Veer savarkar award –1998, Indira Gandhi award –1997, Bharat Ratna – 19997, Padma Vibhushan – 1990, Padma Bhushan –1981

Last days: On 27th July 2015, Kalam went to IIM,Shillong to deliver a lecture on 'Creating Livable Planer-Earth'. When he was five minutes into his lecture, he felt discomfort and collapsed. The doctors declared him dead due to cardiac arrest at 7.45 pm. India lost a great soul.

Conclusion: Kalam was an epitome of simplicity. In spite of his high position, he always resorted to a simple life and above all, he lived up to everything he said, preached, and taught us.

UNIT – 2 **Sir C. V. Raman**

Introduction

Sir Chandra Shekhar Venkata Raman, the Indian physicist who made his motherland proud by becoming the first Indian to win the Nobel Prize for Physics, was a scientist par excellence. . He was intrigued by the blue colour of glaciers and the Mediterranean Sea and wanted to unravel the mystery of water, a colorless liquid, appearing blue to the human eyes. Thus began a series of experiments on the scattering of light which ultimately led to what came to be known as the 'Raman Effect' for which he won the Nobel Prize in Physics.

Birth and Education

Raman was born inTiruchirapalli, which is located on the banks of the most famous South Indian river Cauvery. His parents were Chandra Shekhar Iyer and Parvathi Ammal. His father was a school teacher and had special interest in science and mathematics. Raman was grown in an environment of music, traditional Sanskrit and modern science. He displayed a brilliant mind even as a child and passed his matriculation examination when he was just 11. He joined the

Presidency College in Madras in 1902 and completed B.A. in 1905. He topped the exams and won a gold medal. He joined the same college to pursue Master's degree in Physics and the subject undertaken was matter and energy.

Raman's first job and Research

Though he was deeply interested in science, he appeared for the Financial Civil Service (FCS) examination at the insistence of his father. He topped the examination and went to Calcutta in 1907 to join the Indian Finance Department as Deputy Accountant General. Calcutta was the main centre where scientific research action was taking place in India. Raman's going to Calcutta was a blessing in disguise. The main centres of scientific research developed in Calcutta were The Indian Association for the Cultivation of Science founded by Dr. Mahendra Lal Sircar, one of the leading homeopath doctors and Unversity college of science founded by Mr. Asutosh Mukherjee , who was a judge. At that time he was the vice- chancellor of Calcutta university. He was one of the leading figures promoting scientific research in Calcutta.

Raman as Palit Professor

Although Raman was employed with finance department, he started his research at the The Indian Association for the Cultivation of Science. After ten years of Government services, he resigned from his well-paid job and joined the Calcutta University as a Palit professor of Physics at a lower salary. This clearly showed his devotion towards science and research. In 1917, with the persuasion of Asutosh Mukherjee, Raman joined the university as a full time professor in the newly established Science College.

Asutosh Mukherjee wanted to bring conducive changes in the university. He had a commendable vision as an educationist. While offering the professorship to Raman, Asutosh faced a problem with the policy of recruitment which states that the person had to be mandatorily trained abroad. Raman refused to go to abroad to be 'trained'. For fifteen years (1917-32) he was in the service. During this period, his life was devoted towards research, teaching science and constant upliftment of the standards of education in the Calcutta university.

Contributions and Achievements of Raman

As Palit Professor Raman was not given any teaching responsibility, but he could not keep himself away from teaching. One of his students later recalled that Prof. Raman had taken "Electricity and Magnetism" classes in the year 1920-21 and " Physical Optics" in 1921-22. With sincerity and innovativeness he taught these subjects The students felt excited to listen to his classes where the theories were livened by practical examples.

Even though the facilities available at the Indian Association for the Cultivation of Science were very limited, it did not deter Raman at all who went on to publish his findings in leading international journals like 'Nature', 'The Philosophical Magazine', and 'Physics Review'. During this time, his research was basically in the areas of vibrations and acoustics. In 1919, he was made the Honorary Secretary of the Indian Association for the Cultivation of Science, a post he held till 1933. He was very popular and many students gathered around him, attracted by his immense knowledge of science.

During the late 1920s he experimented on the scattering of light by observing the behavior of monochromatic light which penetrated transparent materials and fell on a spectrograph. This led to the discovery of what came to be known as 'Raman Effect' which he presented at a meeting of scientists in 1928. He was invited by the Indian Institute of Science (IISc), Bangalore to become its Director. He accepted the post in 1933, becoming the first Indian to hold it. He served as the Director till 1937 though he continued as the head of the Physics Department till 1948.
In 1948 he established the Raman Research Institute (RRI) in Bangalore for conducting scientific research in different fields of physics. He continued with his research in the institute till his death.

Raman Effect

He is best known for discovering the 'Raman Effect', or the inelastic scattering of a photon. He showed through experimentation that when light traverses a transparent material, some of the deflected light changes in wavelength. This was a ground breaking discovery in early 20th century physics.

Awards He won the 1930 Nobel Prize in Physics "for his work on the scattering of light and for the discovery of the Raman Effect", becoming the first Indian to win a Nobel Prize in the sciences.

He was honored with the Bharat Ratna, India's highest civilian award, in 1954 in recognition of his invaluable contributions to the field of science.

UNIT – 3 HOMI JEHANGIR BHABHA

Introduction (Life and Academics):

Homi Jehangir Bhabha is a Physicist and he is credited for being the architect of Indian Nuclear Research Programme. He was born on 30th October 1909, into a wealthy Parsi family of Jehangir Bhabha and Meheren. He had close links with the TATAs as Sir Dorab Tata, the son of Sir Jamsetji Tata, was the husband of Homi's paternal aunty.

Bhabha was brought up in an atmosphere of academics and learning. Homi was initiated into literature,fine arts, music and painting, during his formative years.

He went to Cathedral and John Cannon School in Bombay. He passed senior Cambridge examination and then joined Elphinstone College in Bombay. Later he joined The Royal Institute of Science. He joined Gonville and Caius College, Cambridge for his mechanical engineering. He was mesmerized by the intellectual environment that ran at Cambridge in the field of quantum electrodynamics. He wanted to study theoretical physics and mathematics. His father allowed his wish of changing into Physics after his completion of Mathematics and Engineering Tripos. Later, he joined in Ph.D. in Cavendish Laboratory and concentrated in the study of atoms, quantum theory and nuclear physics.

Interaction with the Great Scientists:

During his study abroad, Bhabha was fortunate to develop a good rapport with the Who's Who of the scientific community abroad. Most of them were Nobel Laureates. At Cambridge, his mathematics teacher was Paul Dirac. During his Ph.D., he met Ernest Rutherford, father of nuclear physics. He was the scientist who first proved atom could be split. In 1932, John Cockcroft and E.T.S. Walton achieved the first disintegration of nuclei. The same year, Carl David Anderson discovered positive electron, positron. He proved the theory of Paul Direc true. He met Enrico Fermi, the creator of the first nuclear reactor. He also met Wolfgang Pauli, who did pioneering work in quantum physics. He met Niels Bohr.

His interactions with the great scientists lay a profound foundation of scientific learning in Homi.

Early days as Scientist:

Bhabha-Heitler Theory: In 1936, Bhabha met Walter Heitler from Bristol. Heitler made important contributions to quantum electrodynamics and quantum field theory. Their collaboration resulted in the 'cascading theory of electron showers'. They proposed that cosmic rays are composed of electrons,protons, and gamma rays and they hit the earth from all directions. They said when they enter the earth's atmosphere, they collide with the atoms in the earth's atmosphere and it results in new particles. This leads to a cascading effect and the number of particles increased after collisions. This theory provided a simple verification of Einstein's theory of relativity.

Bhabha Scattering-Positron Theory:

Using Dirac's hole theory, he investigated positron interactions. He wrote a paper on this which highlighted electron positron scattering, a process came to be known as 'Bhabha Scattering'.

Meson theory:

Mesons are unstable sub-atomic particles made up of quarks and anti-quarks. Yukawa Hideki predicted mesons in 1935 through theoretical deductions. Their actual existence was proved later by Cecil Frank Powell. Bhabha studied their existence and stated that positive or negative mesons should spontaneously decay into a positron or electron and the time of disintegration is longer while the particle is in motion. Bhabha proposed vector nature of the meson fields as against the original Yukawa's theory of mesons being the scalar particles.

Return to India- Bangalore Days:

He returned to India in 1939 and he could not go back due to World War II. He was committed to the growth of modern science in India. He wanted to develop human resources and expertise over a wide range of the areas of science and technology and building institutional, administrative and management support and

infrastructure. It made a great difference to India that a leading nuclear energy exponent happened to be working in India.

At IISc Bangalore, he concentrated on cosmic rays and elementary particles. Besides he also worked in the domain of classical theory of point particles moving in the general field. He was elected as a fellow of Royal society.

Bombay Days:

While he was working at the IISc, he stumbled upon his mission in life. He came to realize the immense potential that science and technology to transform India into a developed nation. Since he had spent his time in Europe, he could understand the importance of ground level research. And he wanted India to provide such avenues of research so that for scientific and technological advancement, the country would not be dependent on foreign countries. He saw himself as an institution builder.

Notable Contributions:

TIFR:

In order to fructify his vision of creating institutions of research of global standards in India, he proposed to J.R.D.Tata and Sir Sorab Saklatvala that Tata trust should support in establishment of an institution. With the help of these industrial stalwarts, he founded 'The TATA Institute of Fundamental Research (TIFR)' which geared India towards becoming a self -reliant nation in nuclear power generation and other scientific fields. TIFR started functioning from June 1945 with Bhabha as its first director.

Atomic Energy Commission(AEC):

Soon after the independence, a board of research on atomic energy was constituted under the wings of Council for Scientific and Industrial Research (CSIR) with Bhabha as chairman. Jawaharlal Nehru took the initiation of passing atomic energy bill resulting in creation of Atomic Energy Commission (AEC). Nehru also developed a separate ministry of atomic energy in 1954 for development of atomic energy for peaceful purposes.

Training Scientists Abroad:

He built up the resources for the Indian nuclear programme. He made it a point to send many Indian scientists abroad in the initial stages so that they get to know the advancements going on in the world at that time and they would in turn train the new crop of scientists. For this to happen, he used his personal association with the scientists abroad. This gesture helped the country immensely for honing u p the expertise and capabilities of the Indian scientists to keep abreast with the latest developments around the world.

Apsara Reactor:

Bhabha was able to indigenously develop capabilities for the complete nuclear cycle right from sourcing of uranium, purification of fissile materials to designing, fabricating and installing nuclear reactors and their components. He is credited with building the Apsara research reactor to advanced power reactors.

Objectives of Nuclear Programme- Three Stage Programs:

The TIFR steered India with the main objective of self-reliant power generation source.

a) Conduct thorough survey of natural resources such as uranium, thorium, beryllium, graphite identification of rare metals with the help of pioneering geologist of India Darashaw Nosherwan.
b) Develop strong research schools in basic sciences particularly in Physics and Chemistry.
c) To develop a unit related to ‘Electronics’. A new unit called Electronics production unit was started in TIFR.

Further, he developed new nuclear technologies, agriculture varieties, food preservations and nuclear medicine. Bhabha was always a leading advocate of international peace. So, he geared government towards it and harnessed the use of nuclear power towards power generation and medicine. He played key role in international conferences on peaceful use of atomic energy.

Devastation of Second World War:

The lives in the towns of Hiroshima and Nagasaki were mutilated on 6th and 9th August, 1945.The radiation is still affecting many generations. The UN decided to promote international cooperation and so it held the first international conference on peaceful use of atomic energy in 1955 at Geneva, Switzerland. Homi J Bhabha was unanimously selected by scientific advisory committee to the post of President of the Conference. Later, he became the governor of the International Atomic Energy agency at Vienna and member of scientific advisory committee to the Secretary General of UN.

Discoveries and Inventions of Bhabha :

1) In 1936, Bhabha and Walter Heitler, a German Physicist worked together and developed "Cascade Theory of Electron Showers" which explains the process of components of cosmic rays entering earth's atmosphere and new set of particles evolve after collisions.
2) He developed in collaboration with HR Hulme, the investigation of electron positron scattering which was popularly known as 'Bhabha's Scattering Theory'.
3) He predicted the name Meson, unaware of its existence which was also known as Mesotron founded by Carl David Anderson which was later logically changed as Meson by him.
4) He played key role in development of quantum electro dynamics.
5) His association with Wilfred Lewis who was known as father of Canadian Nuclear Energy Programme made him to establish TIFR, CSIR in India.

Conclusion/Achievements:

Dr. Homi Jehingir Bhabha contributed to the national building by his achievement in scientific research, discoveries and organizational growth. Honorary doctorates were awarded to him by both India and Foreign countries. He dedicated his time and life solely to the pursuit of his interest in science, atomic energy, art and music.

UNIT -4 Jagadish Chandra Bose

Jagadish Chandra Bose occupies a unique position in the history of modern Indian science. He was born on 30 November 1858 in Mymensingh, now in Bangladesh. Bhagabhan Chandra, father of Bose was a Deputy Magistrate who had good education and strong appreciation for science as a subject.

Eventually, he encouraged his son to pursue science and become a scientist. JC Bose learnt many things from his father and there was impact of his father on Bose throughout his life.

Education

Bhagabhan Chandra did not want his son to have an exclusive upbringing and sent him to an ordinary school where he had the opportunity to mix with rural children of all social classes. Later he went to Calcutta to finish his schooling. At the age of sixteen, he passed matriculation and won scholarship and joined St. Xavier's college, Calcutta. After his studies in India, Bose wanted to go to England. Though his mother opposed that initially, she eventually helped him financially by selling her jewellery.

In England Bose took up the study of medicine. He could not continue it as he was afflicted by fever. He was advised to study science instead. Bose received the natural science Tripos from the University of Cambridge. He studied under eminent intellectuals like Lord Rayleigh, Michael Foster, James Dewar, Francis Darwin, Francis Balfour and Sidney Vines who influenced him a lot.

Career at The Presidency College

J.C.Bose returned from England with a letter of recommendation to Lord Ripon from the then post master general of England Professor Fawcett. Bose met the Viceroy of India Lord Ripon and presented his case. The letter was forwarded to Sir Alfred Croft, the Director of Public Instruction. He offered the provincial service to Bose, but not the Imperial Education Services. The incident reflected the typical British mindset that considered Indian minds inferior to Western minds. Bose did not accept the offer. When this information reached Lord Ripon, he sent a strong letter to the DPI asking him to reconsider the decision. Finally, he was given the post of Officiating Professor of Physics at The Presidency College, Calcutta. But he was offered only half of the salary that the English at the same position got. Bose wanted to fight against this discrimination and for three years he had not taken the salary. Finally the authorities yielded and his salary was increased. The entire episode displays his tenacity.

Early days as a scientist:

On his thirty-sixth birthday Bose decided to pursue scientific research. Bose conducted his researches in a small 24 square feet room which he was given in the Presidency College. He also devised and fabricated a new type of radiator for generating radio news by reading a book by Oliver Lodge. Bose also invented 'Coherer' for receiving radio waves. His instrument was easy to use and better than

the ones used in Europe at that time. He also demonstrated a new type of radio waves as small as centimeter to 5 millimeters. He presented his first research paper before the Asiatic Society of Bengal on "On the Polarization of Electric Rays by double Reflecting Crystals" in 1895. He also sent a paper titled "On determination of the Indices of the Refraction of Sulphur for the electric ray' to the Royal Society of London. The prestigious achievement that he won was, giving a discourse before eminent scientists of the time like Sir James Johnson, Thomson, Olive Lodge and Lord Kelvin. All all these scientists felt happy for the presentation and appreciated the content.

Contributions:

Jagadhish Chandra Bose immensely contributed to both Physics and Biology. However, he never tried to patent his inventions as he always thought that science should benefit mankind. His main contribution to the scientific world is the research on plant responses. He gave a talk on "The similarity Responses of Inorganic and Living Matter" at the Paris international congress of Physicists in 1900. Swami Vivekananda was among the luminaries who attended the discourse.He felt proud of his compatriot. He later descried that Bose representing India was a great leap for India which could take pride in the fact that he was a person of such great scientific achievement.

Bose also studied the various properties of plant tissues and tried to compare the similarity of these responses with those of the tissues of the animals. In his experiments, he also showed that some of the inorganic systems and tissues exhibited the same responses towards stimuli. As he was a physicist, he could device and invent very sensitive instruments to help him in his research. One such instrument that he invented was, Crescograph which measures the growth of the plants in a microscopic way and can record a growth as small as ten-millionth inch per second.

Bose also tried to make such models which were illustrative of physical basis of memory. His findings had wide implications and eventually influenced subjects like Physiology, Chronobiology, Cybernetics, Medicine and Agriculture.

Achievements and Awards:

Bose institute was founded on 23 Nov 1917by him. He was able to collect about Rs. 11 lakh for its endowment programme. He was helped by his friend Rabindranath Tagore in the process.In 1903, Jagadish Bose was honored with title of the Commander of the Order of the Indain Empire (CIE) and in 1912 with the title the Commander of the Star of India (CSI) by the British. He was also given

the title 'Sir' by the British monarch. Bose was also elected a fellow of Royal Society, London.

Unit – 5 **Prafulla Chandra Ray**

Introduction

Prafulla Chandra ray was an eminent Indian scientist, entrepreneur and hailed as the "Father of Indian pharmaceuticals". His notable work on the nitrites and hypo-nitrites of metal, especially on mercury made him win fame worldwide. He was the founder of "Bengal Chemicals and Pharmaceuticals Works Ltd..." He lived an austere life. He was a revered figure not only in Bengal but also in the whole world. As a mark of respect to his work, many institutions were named after him- 'Acharya Prafulla Chandra College' and the 'Bagerhat P.C.College' of Bangladesh, to name a few.

His birthplace and adjoining villages

He was born in a well-to-do family, on 2 August 1861 in Raruli-Katipara, a village in Bangladesh. He beautifully explained the adjoining villages named Sagardari, the birth place of great poet Madhusudan Datta and Polua-Magura known now as Amritabazaar which was the birth place of Sisir Kumar Ghosh, the renowned journalist.

Education

His early education was in his village, founded by his father Harish Chandra Ray. However, he could not make much progress in a village school, as he was frequently absent for the class. Up to the age of nine, he studied in a village school. In 1870, his father migrated to Calcutta for better education of the children. In 1971,he and his elder brother, Nalinkanta were admitted to Hare School, founded by David Hare, born in Scotland, lived in Bengal. Bengal would also be indebted to Hare for his devotion in spreading education in Bengal.

Due to regional discrimination and severe attack of dysentery, he left the school for two years. Taking this as opportunity, he devoted his time to read English classics and the literary and historical writings in Bengali. He learnt Latin and Greek .He was a voracious reader. History and biography were his favourite genres.

After recovering from his illness, in 1874, he took admission in Albert School which was founded by Keshab Chandra Sen. In 1879, he passed the entrance examination and took admission into the Metropolitan Institution which was established by Pandit Iswar Chandra Vidyasagar. In those days, these institutions had no science classes or laboratories and so he attended lectures on Physics and Chemistry in the Presidency College as an external student. Here he was impressed by the chemistry courses of Professor Alexander Pedler. He was not satisfied by seeing demonstrations and doing little experiments in the lab. So, he and one of his classmates made a mini laboratory with crude apparatus and started doing experiments. During one such experiment, there was a terrible blast in their room; however, they came out unscathed. But it did not reduce his interest towards subject.

In 1882, he won one of the Gilchrist Prize Scholarships, which paved the way to England for higher studies. In England he was received by none other than Jagadish Chandra Bose. There he enrolled himself in the B.Sc.Progrmme of Edinburg University where he studied physics, chemistry and biology amongst other subjects. He also developed interest in history and literature written by eminent western scholars. He also read Fawcett's Book on Political Economy and "Essays on Indian Finance". In 1885, he obtained B.Sc.degree from Edinburgh University. From the same University, he also gained doctorate in 1887, for his detailed study on "Conjugated sulphates of the copper magnesium group-A Study of Isomophous Mixtures and Molecular Combinations". Later he was awarded the Hope Scholarship Prize, which allowed him to do research after completion of his doctorate.

Career

He returned to India in August 1888 and subsequently joined Presidency College as Assistant Professor of Chemistry in 1889. In 1894, he established a new chemistry laboratory and worked on food adulteration and got his research published in 'Asiatic Society of Bengal'. At that time, it was British rule, the natives were given less opportunities and paid less compared to them. He worked hard for the welfare of the natives but was not success and later he continued with his duties in same college.

Early Days as Scientist

In 1889, he discovered some of the elements missing from the then incomplete periodic table. While analyzing certain rare minerals, he found hitherto unobserved yellow crystalline deposits and revealed these to be mercurous nitrate, a compound that until then had been considered quite instable. He also developed methods for preparing ammonium nitrite, alkyl ammonium nitrite, and other compounds. And on these researches and results, he wrote more than 100 papers and got published.

He published about 120 research papers, in research journals of international. In 1896, he isolated mercurous nitrite which brought him international recognition. In his autobiography, he stated that the discovery of mercurous nitrite was a new leaf in his life and which made him to encourage publishing in the *Journal of Asiatic Society of Bengal*.

Another important contribution made by him was the synthesis of ammonium nitrite in pure form. He eventually demonstrated his discoveries in front of several renowned scientists in a meeting at the Chemistry Society of London. William Ramsay credited him to be the founder of '*Chemistry school in India'*.

Contribution to Chemistry

He had a long list of contributions and the most important contribution was to develop chemistry teaching and research in India never before. He had a good following of students and many were inspired to take chemistry as their research work. After his retirement from Presidency College in 1916, he joined as Professor of Chemistry in University College of Science and taught the students with experimentation vigour. In 1936, he retired from his service but he continued as an Emeritus Professor. For his continues work, and love and deep respect of his students, an informal title '*Achary*' was given to him.

In 1902, he published, *The History of Hindu Chemistry* and its second volume in 1908.It was ,Marcellin Pierre Eugene Berthelot was role model to him for complete his volumes. It was immediately recognized as a tremendous contribution in the world of science history. Berthelot himself wrote a long review in a French Journal, Des Savant in 1903. The Vice Chancellor of Durham University, Honored D.Sc.degree to him in 1912 and in his speech he articulated that the book was a phenomenal contribution from the scientist to the world.

He was a prolific writer. He wrote many books in English and Bengali. In 1893, he wrote a book on zoology titled Simple Zoology. On the literature side, he wrote articles on Shakespeare in Calcutta Review during 1934-41.He also contributed articles in many of the Bengali periodicals like Basumati, Bangabani, Prabashi etc.

Ray as Entrepreneur

In 1892, he started his Bengal Chemical and Pharmaceutical Works Ltd. with a view creating jobs for unemployed youth. To establish it, he faces several interruptions but his hardship helped to be success. Looking at his company, Sir John Cumming, in 1908 said, it was one of the most forward looking enterprises in Bengal. The company was well managed and it consists of 70 workmen. It produced various chemicals and kept on adding new products like perfumes.

Ray as Philanthropist

He had a deep concern for the people living in rural areas. He frequently visited those areas and took active part in their agricultural and other pursuits. He enjoyed living and staying with them. He took an active part in the Bengal famine of 1922.He called upon his fellow countrymen to contribute and the response was with enthusiasm. In one month they could collect three lakhs of rupees and it was used to help famine hit areas. Someone, seeing at his work he quoted that, he was a a great organizer and a teacher in the truest sense.

He was known as a great philanthropist. He gave most of his earnings to charity. A t the time of retirement, he donated 180,000 rupees to the Calcutta University for the extension and development of the Chemistry Department.

Contributions to Nation

He was a true nationalist and patriot. He was deeply involved in the movement for India's independence with the top leaders of Indian National Congress. The credit to bring Mahatma Gandhi to Calcutta for the first time goes to him. He was closely associated with Mahatma Gandhi and Gopal Krishna Gokhale. Even though he was an eminent scientist, he used to say, "Science can wait but Swaraj cannot."With good relationship with Gandhi he shared and shaped his thoughts towards national movement. The most important lesson he learned from Gandhi was, 'to be close to the mind of people you should be first one among them'.

Achievements

IN 1911, he was honored as the recipient of the "Companion of the Order of the Indian Empire". He was awarded several honorary doctorates from Durham University and Dhaka University. He passed away on 16 June 1944 at his Calcutta residence.

UNIT -6 Srinivasa Ramanujan

Introduction:

Srinivasa Ramanujan was one of the foremost Indian Mathematicians who made significant contributions to mathematical analysis, number theory and continued fractions. He did not receive any formal training in pure mathematics. He started to work on his mathematical research in isolation out of his sheer love for the subject. Thus, he is an example of incredible inborn talent.

Early life and Education:

Srinivasa Ramanujan Iyengar was born on 22 December 1887 in Erode and grew up in the town of Kumbakonam where his father was a clerk in a sari shop. Ramanujan passed his primary examination in1897 and showed promising signs by standing first in the whole district. He passed matriculation from Town High School. In 1904, he entered Kumbakonam's Government College and was awarded a scholarship there. By that time, his interest in mathematics had deepened to a level of obsession. He couldn't do well in other subjects and consequently he was not able to continue the course. In 1909, Ramanujan married a 9 year old girl, Janaki and in 1912 took a clerical post in the Madras Port Trust office to support his wife and mother.

The book 'A synopsis of Elementary Results in Pure and Applied Mathematics' by George Shoobridge Carr, gave him a passion and had set Ramanujan on a path of academic research and discovery. Ramanujan's profound pursuits in mathematics were no bed of roses for him. He had to face immense hardships in following up

his passion. He did not have enough money to buy papers on which he could scribble his research.

Association with Hardy

Ramanujan wrote a letter to G.H.Hardy who was a leading British Mathematician in England. G.H.Hardy and J.E.Littlewood had good partnership. Together they wrote 100 papers on mathematical topics. Hardy showed Ramanujan's letter to J.E.Littlewood. Ramanujan's letter was crammed with as many as 60 mathematical theorems and formulas stated without any proofs. They did not take long to realize that Ramanujan was a genius. Hardy sent a formal invitation to Ramanujan to come to England to study at Cambridge and continue his research. Ramanujan's mother forbade him to cross the ocean to go to England. Eventually in 1914, she agreed to let him go and Hardy arranged a scholarship for Ramanujan.

Hardy worked very hard along with Ramanujan in refining and enhancing his knowledge. Ramanujan was awarded the B.A. degree in March 1916. He had submitted extensive work on "Highly Composite Numbers' which was published in the Journal of the London Mathematical Society.

Contributions and their Significance: Ramanujan's knowledge of mathematics was startling. Although he was almost completely unaware of modern developments in mathematics, his mastery of number theory was unequaled by any living mathematician. Number Theory includes analytic number theory-which uses vectors and matrices and probabilistic number theory based on probability theory. Ramunujan's work is known for its deep and infallible originality.

Ramanujan had other discoveries as feathers in his cap. But the real importance of most of his works could not be understood those days. He was great at looking straight through the arcane relationships between various mathematical objects. Ramanujan's work has some applications in particle physics as well as in the calculation of pi up to a very large number of decimal places. His research on Rieman's zeta Function has been applied to the pyrometry- the investigation of the temperature of furnances. His work on the partition numbers resulted in two applications -new fuels and fabrics like nylons.

Achievements:

Ramanujan was elected a Fellow of the Royal Society and he was only the second Indian to achieve this. Indeed he was then one of the youngest fellows in the entire history of the Royal Society. Even he was the first Indian to receive Fellow of Trinity College, Cambridge.

Untimely End of a Great Mind:

In the May of 1917, Ramanujan showed the first sign of being unwell. He succumbed to Tuberculosis in Kumbakonam on 26 April 1920 at an early age of 32. The achievements of Ramanujan were great, impactful and powerful. He left behind three notebooks which are filled with 4000 result.

----------XXXX----------