# EMPLOYMENT AND EMPLOYABILITY OF ENGINEERING GRADUATES IN KERALA

*Thesis Submitted to the University of Calicut*

*for theAward of the Degree of*

DOCTOR OF PHILOSOPHY IN ECONOMICS

**By**

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# Certificate

This is to certify that the revisions are made in the thesis as per the suggestions made by the adjudicators of the thesis. I also certify that both the hard copy and the soft copy are one and the same.

Place: Chalakudy
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# CERTIFICATE

This is to certify that the study entitled "**EMPLOYMENT AND EMPLOYABILITY OF ENGINEERING GRADUATES IN KERALA**" is a bonafide research work done by SRUTHY K.S., carried out under my supervision and guidance at the Research and PG Department of Economics, P.M. Govt. College, Chalakudy, Thrissur. The contents of this thesis, in full or in part, have not been submitted and will not be submitted to any other institute or University for the award of any degree or diploma. Plagiarism is checked and found within the permitted limits.

**Dr. Sinitha Xavier**

Potta

Research Supervisor

# DECLARATION

I, **Mrs. Sruthy K.S.**, hereby declare that the thesis entitled '**EMPLOYMENT AND EMPLOYABILITY OF ENGINEERING GRADUATES IN KERALA**' submitted by me for the award of the Degree of Doctor of Philosophy in Economics to Calicut University is the original work done by me under the guidance and the supervision of **Dr. Sinitha Xavier,** Research Supervisor and Assistant Professor, Research and PG Department of Economics, P.M.Govt.College, Chalakudy. I also declare that this thesis has not been submitted to any other University for the award of any other degree, diploma, associate-ship, fellowship or title or recognition and no plagiarism is made in the thesis.

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**SRUTHY K.S.**

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**SRUTHY K.S.**

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# ABBREVIATIONS

| | |
|---|---|
| B.Tech | Bachelor of Technology |
| BPO | Business Process Outsourcing |
| IT | Information Technology |
| UR | Unemployment Rate |
| ATMR | Annual Technical Manpower Review |
| NTMIS | National Technical Manpower Information System |
| NSSO | National Sample Survey Office |
| CDL | Career Development Learning |
| ILO | International Labour Organization |
| LFPR | Labour Force Participation Rate |
| STEM | Science, Technology, Engineering and Mathematics |
| OECD | Organization for Economic Co-operation and Development |
| AICTE | All India Council for Technical Education |
| IAMR | Institute of Applied Manpower Research |
| AMCAT | Aspiring Minds' Computer Adaptive Test |
| NASSCOM | National Association of Software and Services Companies |
| ITES | Information Technology Enabled Services |
| BPO | Business Process Outsourcing |
| KTU | Kerala Technological University |

# ABSTRACT

Kerala has achieved ample progress in education and attained highest rate of literacy among other states of India. Kerala's engineering education was booming at a fast rate with more engineering institutions and branches of study during the period from the year 2000-2016.Nevertheless employment opportunities in the state have not improved equivalent with the increased supply of educated manpower. Demand for engineering education was growing in Kerala which was reflected in the increased intake of students in the engineering stream. Considering the escalation of engineering institutions, and the intake of engineering students, it was persuasive to analyse the prospects and problems of the details of employment and factors affecting employability. Thus the present study centered on the employment and employability of engineering graduates in Kerala.

As per the objectives set up in the study, the first objective was the trend and pattern of supply of engineering graduates in Kerala. The secondary data collected for the analysis was from the period of the year 2000 to2016.The analysis of the secondary data found out that there was an increase in the intakes of engineering graduates and the rate of outturn was increasing at a decreasing rate. The intake of male students was proportionately more than female students. Non-Linear Regression was used to find out the relationship between the dependent variable; years (2000-2016) and the independent variables; outturn and intake respectively.

The present study found out that 52.6 per cent of the graduates from the engineering stream worked in IT sector irrespective of their branches of specialization, 18.8 per cent worked in Clerical area, Government sector and Business Process and Outsourcing (BPO).The study found out that 90 per cent of the employed graduates were employed in private firms in Kerala. 7.8 per cent were placed in government institutions and 2.2 per cent were occupied in aided (private and government) institutions. The study analyzed that the problems faced by the engineering graduates were low salary, less chance of promotion, poor working situation, and lack of time for family considerations. The present study used the Career EDGE model as the theoretical frame work. Twenty Eight factors were employed to find out the employability of engineering graduates as was given in the original model. The statistical tool Factor Analysis was worked out and found out that eight factors affected the employability of employed engineering graduates in Kerala. They were Career Development Learning(CDL),Subject Knowledge and Experience(SKE), Capability of Engineering

Graduates (CEG), Intuition and Time Allocation(ITA), Emotional Intelligence(EI), Self – Confidence(SC),Comprehensive Behaviour (CB) and Innovation. Career Development Learning had highest factor loadings as far as the employability of engineering graduates were concerned. The Factor Loadings of Career Development Learning was 0.920. Further the study used the statistical tool of Independent Sample Test and the score value indicated that there was no statistically significant difference between factors of the model of employability and the differences of gender. The study suggests that the curriculum and syllabus of the engineering graduation should be re-modeled in such a way as to include more skill development programmes and practical classes to make the education in the engineering sector attractive, hi-tech and employable.

## 1.1 Introduction

India is one of the developing and growing economies of the world. A serious issue for the future success of Indian industry is the progress of engineering education in India. In a progressive and technologically reliant world, development of higher education sector is much imperative in an emerging economy. India holds a very advanced higher education system, which offers the facility of education and training in almost all aspects of human creativity and academic activities like arts and humanities, natural, mathematical and social sciences, engineering, medicine, dentistry, agriculture, education, law, commerce and management,music and performing arts, national and foreign languages, and communications (World Bank Report, 2007). India has evidenced by phenomenal growth and development in technical education during the past two decades. Effective engineering education depends on the quality of engineering institution, quality of programmes, branch of specialization offered by the institution, quality of faculty availability, quality of teaching learning process, quality of management, and quality of students. The successful engineering graduates form a world class work force who can augment the development of the society or country (Mishra, 2007). Engineering is a subject and practice as well which stress specially in social activity with political, ethical and economic dimensions. It is a fact that there is worldwide transformation in engineering education driven by industry needs. Engineering knowledge directly or indirectly contributes to the Gross Domestic Product of every nation finally leading to human well-being. Employment in engineering permits for a variety of skills, including visualization and communication skills. Engineering Education should enable a nation achieve higher economic growth rate through effective employment of engineering graduates. Engineering institutions have been on the increase year after year all over the world including India. In recent past, India has perceived a number of changes in learning sector with the adoption of the policy of liberalization. These deviations have affected the supply, demand and quality of the engineering education. The concept of higher quality, lower cost of production and service are the emerging needs of today's customers (Joseph Rosiczkowski, 1993).

Kerala has the highest proportion of literate persons in the population among the Indian States. This state has followed a development path quite different from that of other states of India. The focus on education has resulted in a faster growth rate. Kerala still requires some serious interventions to enhance academic quality at school as well as

higher education levels, and to make education even more inclusive at all levels (Economic Review, 2018). Education plays a twin role in society, first as supporter of economic growth and another as equalizer of income distribution. Kerala's engineering education was booming at a faster rate up to the year 2016 with more engineering institutions in various disciplines (Economic Review, 2017). Employment opportunities in the state have not enlarged proportionate with the increased supply of educated manpower. Unemployment among the engineering graduates, increasing number of engineering institutions, underemployment and level of employability of engineering graduates in Kerala draw the attention of the researcher to look deep into the various aspects of these areas.

## 1.2 Background of the study

Employment and employability are not the same but two different concepts which are related to an individual attaining a job. Technical education in Kerala has undertaken remarkable changes in recent past. The majority of engineering graduates are seeking employment that are not related to engineering and having only lower prospects, the blame has to be put on the increasing number of private engineering colleges (Kerala:AICTE,2018). For accelerating the pace of economic growth, the country needs to focus more on technical oriented education that promotes scientific thinking, because technology and production are directly related. Technical education therefore occupies a significant place in the overall education system of any country for promoting economic growth. It also provides an opportunity to the people for the development of their skills in consonance with the current and emerging demands in the respective fields of knowledge to make them internationally competitive and absolutely fit for any employment in their respective areas of specialization (Shelly,2015). In Kerala, only the number of unemployed engineers doubled as the unemployment among the diploma engineers increased from around 1100 to 2100 during the period from the year 2000 to 2004 and the number of unemployed graduates increased from around 6100 to 11,200 during the same period(Mathur,2008). Kerala has the highest Unemployment Rate (UR) of 12.5 per cent as against the all India level of five per cent (Annual Employment Unemployment Survey 2015-16). Productive employment of youth is an essential factor for economic development. In Kerala, the youth account for around 23 per cent of the State's population. The unemployment rate of the youth is 21.7 per cent for rural areas and 18.0 per cent for urban areas. Similarly, the unemployment rate among the female youth is also

much higher than that of the male youth. The district of Thiruvananthapuram ranks first in the number of job seekers in the categories of general, professional and technical realm. The number of professional and technical job seekers was 2.87 lakh (Economic Review 2018). The job opportunities of the engineering graduates do not grow in the same pace which matches the engineering turnouts in each year. In such a situation, the importance of employability would be quite appalling. This encouraged the investigator to have a study on the employment and employability of Engineers in Kerala.

## 1.3 Significance of the study

Technical education plays a vital role in human resource development of the country by creating skilled manpower, enhancing industrial productivity and improving the quality of life of its people. Technical Education covers programmes in engineering, technology, management, architecture, town planning, pharmacy, applied arts and crafts, hotel management and catering technology (Ministry of Human Resource Development Report, 2018). Technology is touching every aspect of life and society. After independence, technical education system has grown, offering opportunities for education and training in variety of disciplines all over the country (Bose, 2017). India is famous for creating graduates of the highest capability; however only few were matched with its population receiving high quality of technical education. Over the years, India has significantly strengthened quality and accessibility of technical education, expanding the employment rate of graduates who are better suited to the needs of the industry. Employment is an essential part of social, economic and development process of any country. Skills and knowledge are evident requirements for any job. Technically qualified graduates are very important to enhance economic growth. Engineering and technical education all over the world is gaining importance day by day because of rapid advancements in Science and Technology and innovations in various disciplines due to constant and continuous research in each and every field. The skillful, artful and constructive education upsurge the number of application minded mankind who are essential for the socio-economic development of any country (Directorate of Karnataka Technical Education, 1998). In India, there is an expansion in the IT or software industry and the emergent need of the engineers in this sector would definitely improve the scope of work of the engineers. During the period of the years 2008-09, the outbreak of global recession created more unemployment problems for the engineering graduates. In the post-recession period, the extent of the problem of unemployment affecting the degree of

engineers has widened. The present study becomes relevant due to employment and employability potentials of the engineering graduates in Kerala.

## 1.4 Research Gap

There are several studies on employability, employment and unemployment issues of engineering graduates. Majority of these studies are from issue perspective. None of the studies conducted in Kerala so far absolutely dealt with employment and employability linked together especially at the engineering graduation level. Moreover there are no studies available which look specifically into the employment and employability of engineering graduates in the state of Kerala. The present study fills this research gap.

## 1.5 Statement of the Problem

The State of Kerala is blessed with high literacy rate but educated unemployment is the fundamental issue of the labour market in Kerala. The state of Kerala has 183 engineering institutions. Among these, self-financing colleges are the majority (171)(Economic Review, 2018). Self-financing colleges, offering B.Tech are more than the purely government and government aided engineering colleges in Kerala. Engineering education has a decisive role of moulding technically skilled human capital for the renovation of the nation. Engineering education in Kerala has become attractive to all categories of people in the society. The reason is that the society has grasped the high economic status acquired out of this form of education. This has enlarged its demand to a great extent. Engineering education demands heavy investments on the part of the parents as well as the government. But miserably that, there has not been a balanced increase in the earnings structure of engineers except in the case of a few who are employed in multinational companies. This is because after graduation the engineering turnouts fail to find a job. Many of the graduate students are not working in their own graduation field. At this juncture, the concept of employability creeps into the scene. This leads the researcher to look deep into the aspects of employment and employability. A scientific investigation is necessary to find out the factors leading to the employability of the employed engineering graduates in Kerala. The current research is an endeavour to study the various types of employment and the nature and types of employment they have achieved and factors of employability of engineering graduates of the various categories of engineering stream in Kerala. Such a phenomenon raises certain basic research questions:

### Research Questions:-

1. Do the employed engineering graduates of Kerala get job in their respective areas of specialization?
2. What are the nature, types and condition of employment of engineering graduates in Kerala?
3. What are the factors affecting the employability of engineering graduates in Kerala?

The first and second research questions discuss the variations in the employment of engineering graduates. Nature, types and conditions of employment that they attained after their degrees are different from their areas of specialization. The analysis was elicited from the primary survey. The tools used for this analysis were Independent Sample t-Test, Correlation and Descriptive Statistics.

The third research question discusses the employability of engineering graduates in Kerala. In Kerala, engineering institutions were increasing and the numbers of engineering graduates were also on the rise. But job opportunities do not match the employability level of engineering graduates. To analyze the research question the statistical tool of Factor Analysis within the framework of Career EDGE model was used. To find out the relationship between eight high loading factors (Career Development Learning, Subject Knowledge and Experience, Capability of Engineering Graduates, Intuition and Time allocation, Emotional Intelligence, Self-Confidence, Comprehensive Behaviour and Innovation) and to find out the relation variables such as gender, district, marital status and type of institutions, the tools of ANOVA and Independent Sample t-Test were applied.

## 1.6 Objectives

1. To find out the trend and pattern of supply of engineering graduates in Kerala from the year 2000 to 2016.

2. To examine the nature, types and conditions of employment that the engineering graduates have received.

3. To identify the factors affecting employability of engineering graduates across various branches.

## 1.7 Hypotheses

The following hypotheses were formulated for testing.

- The variable supply of engineering graduates in Kerala decreases to the distribution disproportionate between the intake and outturn of engineering graduates.
- There is a significant difference between the variables gender and salary of employed engineering graduates in Kerala.
- There exist differences between salary and years of services of the employed engineering graduates.
- The variables such as the differences of gender and factors of employability of engineering graduates do not have any relationship.

## 1.8 Concepts and Definitions

The popular definition of the important concepts used in the study is given in section 1.8.

### 1.8.1 Employment:-

A contract in which one individual, the employee, decides to perform work for another, the employer (Legal Dictionary).

### 1.8.2 Employed:-

Persons who work regularly at the same job a minimum of one hour for compensation and benefits, or minimum of 15 hours of unpaid work in a family business, fulltime or part-time during a specified payroll period. That is employed person (The Law Dictionary).

### 1.8.3 Employability:-

Employability is a set of achievements-skills, understandings and personal attributes that make graduates more likely to gain employment and be successful in their chosen occupations, which benefit themselves, the workforce, the community and the economy (Yorke, 2006).

### 1.8.4 Unemployed:-

Persons who, owing to lack of work, do not have work but either sought work through employment exchanges,intermediaries, friends or relatives or by making applications to prospective employees or expressed their willingness or availability for work under the prevailing conditions of work and remuneration, and are considered as those ‘seeking or available for work’(MOSPI,Government of India).

### 1.8.5 Labour Force:-

Persons who were either ‘working ‘(or employed) or ‘seeking or available for work’ (or unemployed) constitute the labour force (Ministry of Statistics and Programme Implementation).

### 1.8.6 Educated Unemployed:-

The unemployed having matriculation certificate or higher qualification are classified into the category of educated unemployed (Alphonsa, 1994).

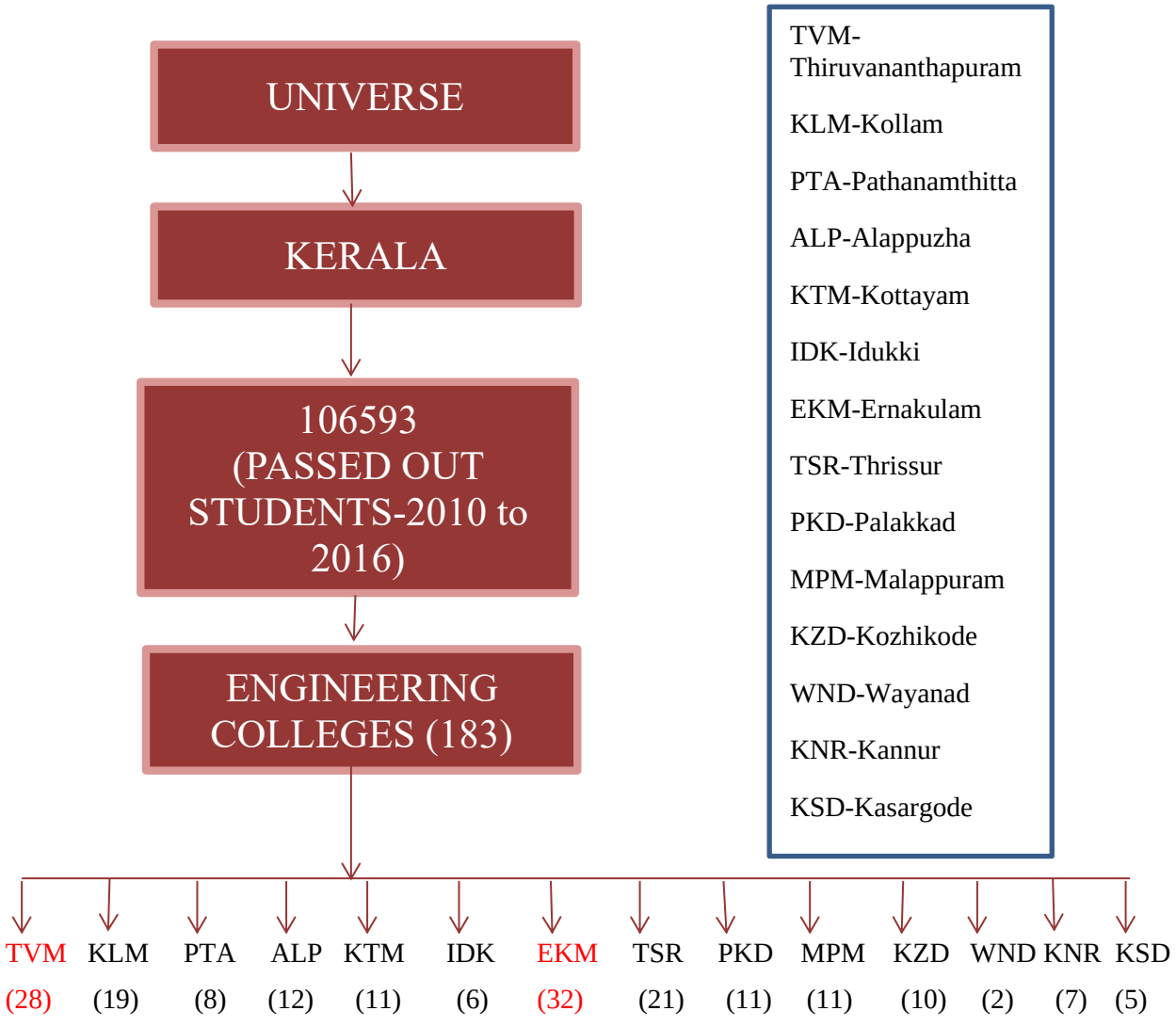
### 1.8.7 Employability Skills:-

Overtoom (2000), defined employability skills as “transferable core skill groups that represent essential functional and enabling knowledge , skills and attributes required by the 21$^{st}$ century workplace necessary for career success at all levels of employment and for all levels of education”.

## 1.9 Methodology

To fulfill the objectives of the study both primary and secondary data were collected. Primary data was collected from employed engineering graduates from sample districts by making use of mailed questionnaire, schedule method and participant observation. Primary data was collected through questionnaires and schedules from the fresh employed and experienced engineering graduates in Kerala. The primary data was collected from those engineers who passed during the period from the year 2010 to 2016 and have completed their courses within this given time frame. The sample survey was done in two districts (Thiruvananthapuram and Ernakulum) in Kerala and in selected five branches of specialization namely Electronics and Communication Engineering, Mechanical Engineering, Civil Engineering, Computer Science Engineering and Electrical and Electronics Engineering.

The secondary data was collected from various sources like the Decennial Census Report, Publications of State Planning Board, Department of Economics and Statistics; Reports of the rounds of National Sample Survey Organization(NSSO) (43rd,50th,55th,61th,66th and 68th Round), Economic Reviews of Government of Kerala, National Employability Reports, Unpublished data on various Universities(Universities in Kerala ,Kannur, Calicut, Mahatma Gandhi and Cochin University of Science and Technology) in Kerala, National Technical Manpower Information System (NTMIS) Nodal Centre for Kerala (2000-2012),Annual Technical Manpower Review(ATMR),All India Council for Technical Education (AICTE) and India Skill Report.




## 1.9.1 Data Collection Methods, Management and Analysis

The study depends on both primary and secondary data. The secondary data collected from the various reports of National Technical Manpower Review and NTMIS bulletin for the state over the years (2000-2012) was subjected to trend analysis for

estimating the trend of supply of engineering graduates in Kerala across the branches of the study mentioned in section 1.9. Primary data which was collected from the employed engineering graduates were subjected to statistical analysis using tools, such as descriptive statistics (mean and standard deviation). Career EDGE model was used and developed by Decre Pool and Peter Sewell. The other statistical tools were Independent Sample t-Test, ANOVA (Analysis of Variance), Correlation and Factor Analysis.

### 1.9.1.1 Statistical Tools Applied for the Objectives

**1.To find out the trend and pattern of supply of engineering graduates in Kerala from the year 2000 to 2016.**

Regression analysis and Branch wise curve fitting were done for the analysis of the first objective of the study. The cubic equation $f(x)= ab^3+bb^2+cb+d$ where $a\neq0$ is used to fit the trend curve for the secondary data from the year 2000 to 2016.

**2. To examine the nature, types and conditions of employment that the engineering graduates received.**

Frequency tables, Correlations and Independent Sample t-Test were used for the second objective.

**2.To identify the factors affecting employability of engineering graduates across various branches.**

Career EDGE model was used for the analysis. 28 statements were employed as in the original model. These statements were used in the questionnaire to find out the factors affecting employability of engineering graduates. In the model, the employability is divided into a number of parameters. Weightage is given to each response and later used the factor analysis to find the important factors affecting employability of employed engineering graduates in Kerala.The steps used in the analysis are:

**Step 1-** As per the Career EDGE model, there are different factors associated to find out the employability. In the present study, the indicators are divided into five main factors and they are Career development learning, Experience Work and Life, Degree Subject Knowledge, Generic Skills, and Emotional Intelligence respectively. All the indicators were subdivided and these subdivisions were coded and ranked depending on the nature of the variable. For example, regarding Career Development Learning, one

indicator is “I know what kind of work would suit my personality” and given the score values were from 1 to 7. The perceptions were “Strongly Disagree”, “Disagree”, “Slightly Disagree”, “Neither Agree nor Disagree”, “Slightly Agree”, “Agree” and “Strongly Agree”. Since the perceptions were in different scales, for comparison and additivity, they were converted into percentages.

**Steps 2-** In career EDGE model, five factors were more concentrated. They were Career Development Learning, Experience (Work and Life), Degree Subject Knowledge and Skills, Generic Skills and Emotional Intelligence. After the factor analysis, eight factors affecting employability of engineering graduates were identified. Career Development and Learning, Subject Knowledge and Experience, Capability of Engineering Graduates, Intuition and Time Allocation, Emotional Intelligence, Self-Confidence, Comprehensive Behaviour and Innovation are the eight factors affecting employability of engineering graduates in Kerala.

**Step 3-** Identified the factors which were having more factor loadings and in each factor, which statement was more loaded.

### 1.9.2 Area of the Study

The two districts selected for the study were Ernakulam and Thiruvanthapuram. The district of Ernakulum was selected because the highest number of the engineering colleges and graduates passed out were in Ernakulam district as per Economic Review of the year 2016. The district of Thiruvananthapuram was selected because it was second only to Ernakulam in having the highest number of engineering colleges and passed out engineering graduates. By studying the engineering graduates of these two districts, a better picture of the employment and employability could be analyzed well. In Kerala, the engineering students are selected through the Common Entrance Test. The students studying for example in Thiruvananthapuram are not all based from Thiruvananthapuram and they are also from northern and centre regions of Kerala. Thus the selected two districts were Ernakulam and Thiruvananthapuram on the basis of the highest number of engineering institutions.

There are 12 engineering colleges selected for the study. Six from Ernakulam and 6 from Thiruvanathapuram.In Ernakulam, Matha Engineering College, Schol of Engineering Cusat, Mar Athanious College of Engineering Kothamangalam, Albertian

Institute of Science & Technology Kalamassery, Sreenarayana Gurukulam College of Engineering Ernakulam, Federal Institute of Science & Technology Angamaly. In Thiruvananthapuram district, we have selected Govt. Engineering College (Barton Hill) Thiruvanathapuram , University College of Engineering & Technology, MG College of Engineering Thiruvanathapuram, Mohandas College of Engineering & Technology Thiruvanathapuram , College of Engineering Thiruvanathapuram, Marian College of Engineering Thiruvanathapuram.

### 1.9.3 Sample Frame

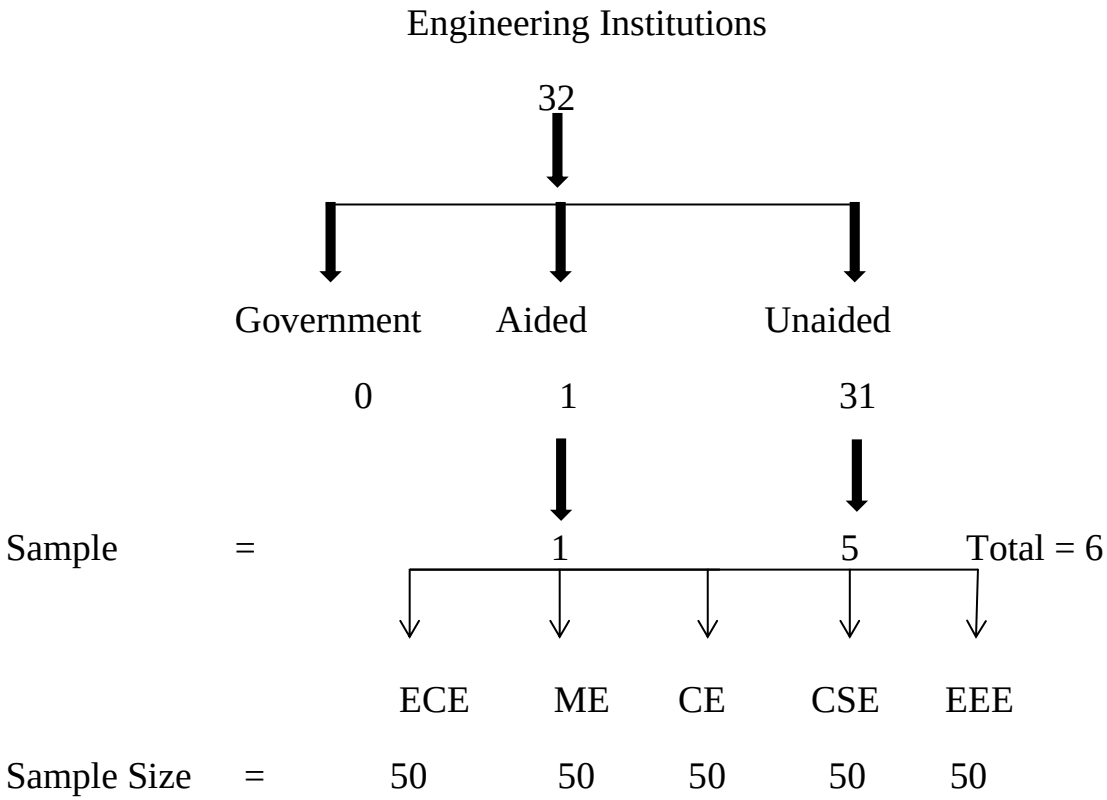
The engineering graduate in the selected two districts of the study constituted the sample frame. The sample frame organized the passed out graduates from government, aided and private engineering colleges. In the district of Ernakulam there is no government engineering college and the district of Thiruvananthapuram has two government engineering colleges. Therefore, the two government engineering colleges were selected for the study. Composite lists of passed out students were collected from the selected engineering colleges. Then the sanctioned intake from five branches mentioned in section 1.9 were collected.

### 1.9.4 Sample Design

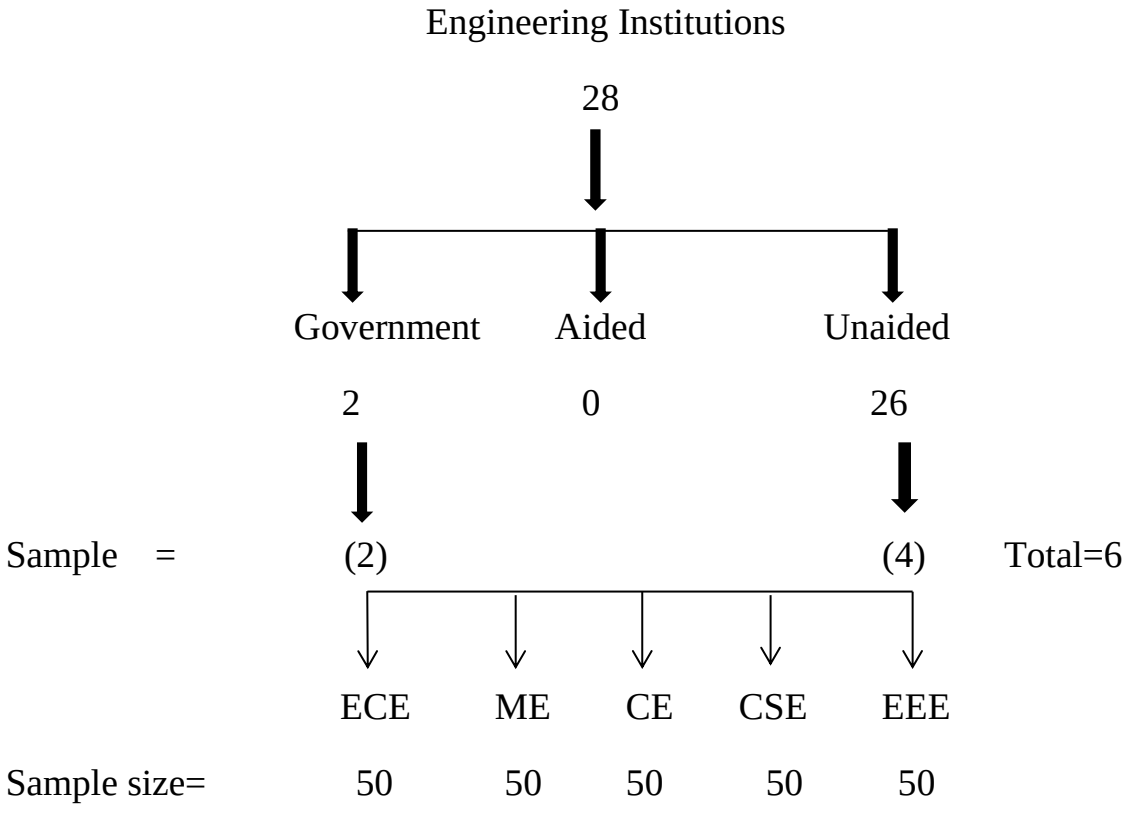
The samples collected were based on multi-stage sampling method. The multi-stage sampling was executed in multiple stages using small and smaller sampling units at each stage. First of all, two zones were selected i.e. the districts of Ernakulam and Thiruvananthapuram as mentioned in section 1.9.2. So, the northern part of Kerala was automatically skipped out. Then we used stratified random sampling for selecting type of colleges like government, private and aided. A random selection of the engineering graduates from the selected two districts were done. The sample branches selected were Electronics and Communication Engineering (50)[1] , Mechanical Engineering (50)*,Civil Engineering (50)*,Computer Science Engineering (50)* and Electrical and Electronics Engineering (50)*. Thus the total sample is 500 who were employed engineering graduates of Kerala.The multi-stage sampling is explained in the following chart

[1] **** Yamane formula $\frac{N}{1+Ne^2}$ was used to find out standardized sample. Since intakes were almost same. The rounded figure of 50 for each branches were selected. The total sample constitutes 500.

**Ernakulam**




**Thiruvananthapuram**



Thus total sample in the study was 500 employed engineering graduates.

### 1.9.5 Pilot survey

A well- structured interview schedule was devised and a pilot survey was conducted to test the suitability of the schedule to get the needed information systematically. The designed questionnaire was administered on 50 individuals of the different engineering branches. The data was analyzed and verified. Necessary modifications were made in consultation with experts in this area and the final tools were prepared for the collection of data.

## 1.10 Limitation of the study

The collection of secondary data was time consuming and expensive. It was very difficult to obtain secondary data than initially expected. There were two reasons for this. The first one was due to the delay in getting it from the departments of universities in Kerala and Nodal Offices. The second one was that the earlier data was not available electronically and hence it was tedious to generate them from the departments of the Nodal Centres and Universities in Kerala.

## 1.11 Chapter Scheme

The study is presented in seven chapters.

1. The first chapter discusses the introduction, background of the study, significance, statement of the problem, objectives, hypotheses, concepts and definitions, methodology, limitations of the study and the chapter scheme.

2. The second chapter provides theoretical frame work used of the study and review of literature.

3. The third chapter gives an overview of Employment and Employability: World, India and Kerala scenario.

4. Chapter four is devoted to the analysis of the secondary data. It deals with the trend and pattern of supply of engineering graduates.

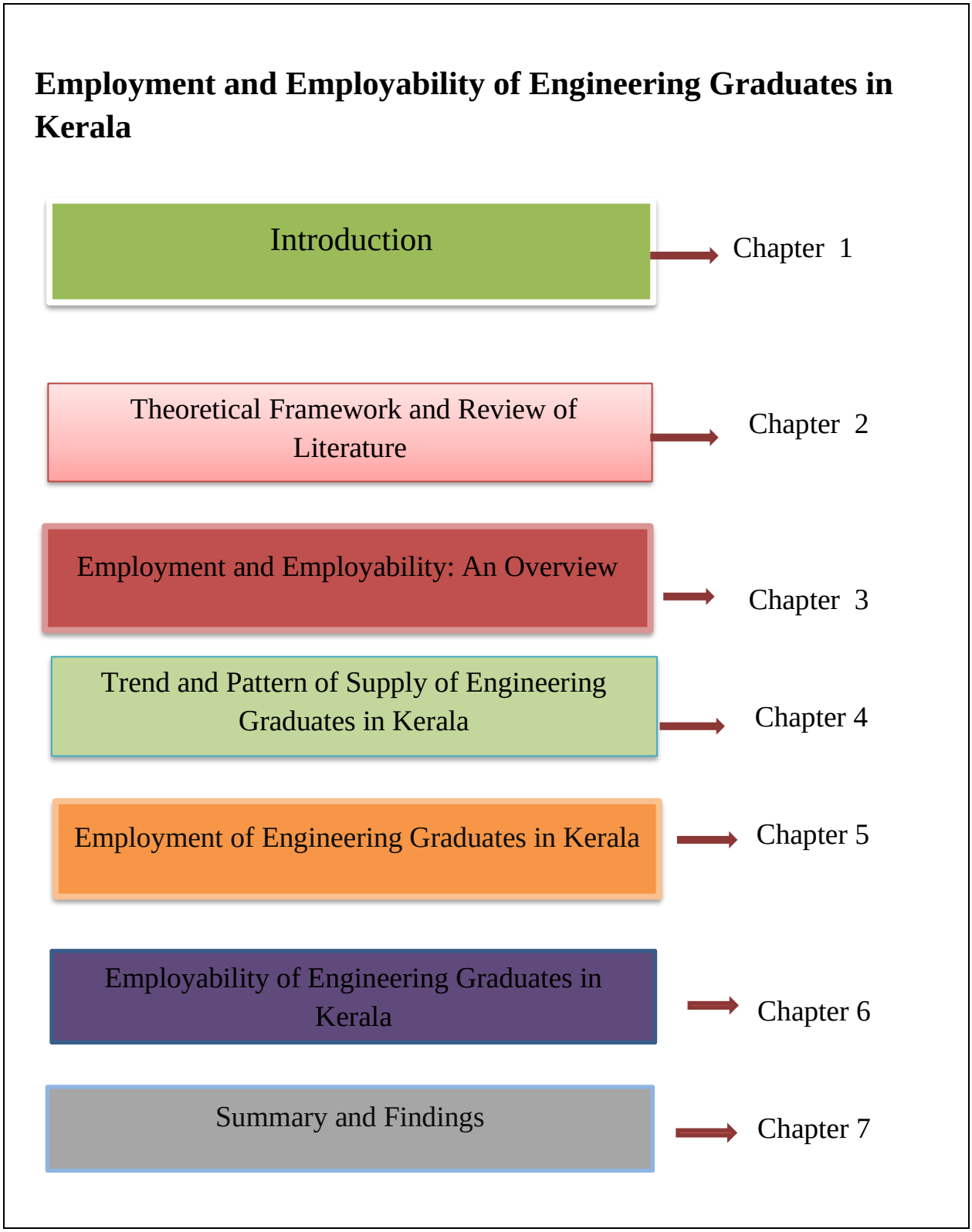
5. Fifth chapter analyses nature, types, and conditions of employment and employability of engineering graduates in Kerala.

6. Sixth chapter provides an analysis of identifying the factors affecting employability of employed engineering graduates in Kerala.

7. Seventh chapter makes the concluding discussions.

Figure 1.1

Scheme of the Study



## 2.1 Introduction

In a creative economic growth, employment is the furthermost conspicuous factor. Every employee needs some employability skills. This helps to attain a good satisfied job. For a better understanding of the employment and employability a theoretical base is necessary. This chapter is divided into two sections. The first one is theoretical framework of the study and the second is reviews of previous studies. A theoretical framework is a gathering of connected notions, like a theory but not essentially so well worked-out. The framework tries to study the associations among variables of employability.

## 2.2 Theoretical Framework

The theoretical framework delivers a general depiction of connections between variables in a given phenomenon. It will provide structure and monitor the research study. This deals with the contextual framework that supports investigation and offers the reader a justification for the study of a particular research problem. It comprises of the variables proposed to measure and the relationships pursued to realize.

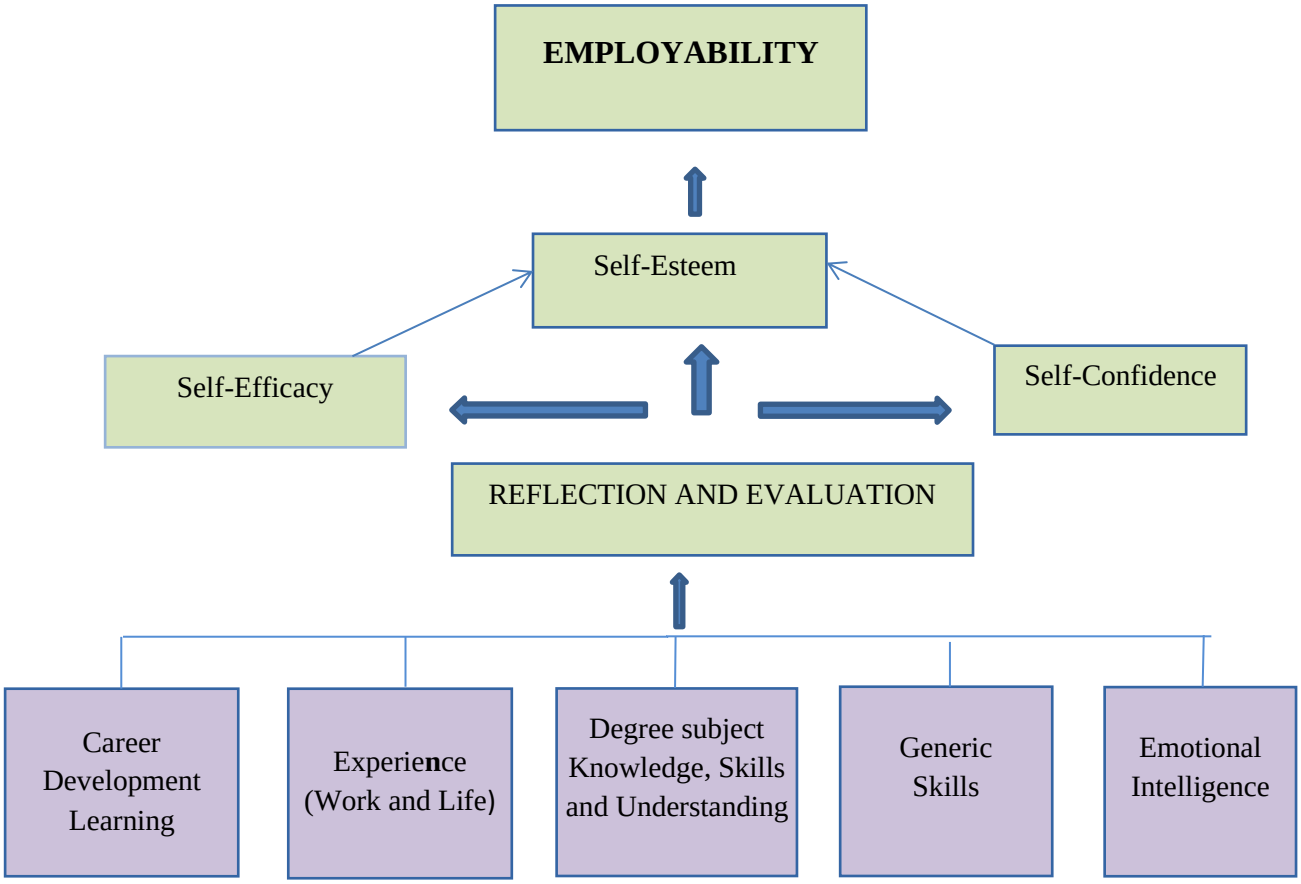
There are many models related to employability. Among these, a suitable model was used for this study. The model used is Career EDGE model.

### 2.2.1 Career EDGE Model

The study depends on the most expanded theoretical frame work on employability by Decre Pool and Peter Sewell in 2007. This model is a new theoretical and practical outline of employability. They argued that to recognize employability, it is essential to consider each component of the model and notice that misplaced factor diminish the graduate's employability. The model described in detail the fundamental components of employability and also recommended the direction of interaction between the various elements. The term "Career EDGE" is used as an aid to remember the five components on the lower tier of the model. The model suggested the opportunities of students to access the factors and enlarging these factors will result in the development of higher levels of self-efficacy, self-confidence and self-esteem – the decisive links to employability.

**Figure:2.1**

**Career EDGE Model of Employability**




**Source:** "The Key to Employability: Developing a Practical Model of Graduate Employability", Decre Pool and Sewell (2007).

They proclaim that all elements of this model are essential. The omission of any element will result in severe decrease in graduates' employability. There are two layers in this model. The lower layer consists of five basic elements that students can work on to approach their employability. The middle layer, which is reflection and evaluation, calls for a higher level of processing on what students have already acquired so that ultimately and hopefully their self-esteem, self-efficacy and self-confidence, resting at the high tier and closely linking to employability, can be improved. The fullness and ease of understanding of this model considerably enlarge its practicability in the field of employability research. Dacre Pool and Sewell (2007) exposed that this model permits lecturers, personal tutors, career advisors or anybody else to elevate employability in the higher education circles without clouding the issue in complexity.

#### 2.2.1.1 Career Development and Learning (CDL)

Career Development and Learning (hereafter CDL) provides students with support and guidance that enables them to progress their self-awareness. CDL includes the activities that encourage students' self-employment which is something that they might wish to explore. We can also help them to become competitive in graduate labour market by ensuring their practical know-how in the field. This factor also analyzes how their time within higher education has enabled them to develop both personally and professionally into the graduate recruits potential employers are looking for. Among all the elements of CareerEDGE, CDL is an essential component. A learner may gain an excellent degree and improve many of the skills employers are looking for, but if they are unable to decide what type of occupation they would find satisfying or are unaware of how to articulate their knowledge and skills to a prospective employer, they are unlikely to achieve their full job potential.

#### 2.2.1.2 Experience – Work and Life

Another element from the lower tier of the CareerEDGE model is that of 'Experience'. It embraces work experience but, significantly for many students, other life experiences too. Harvey (2005) opposes that, full-time younger students have not got significant work experience as part of their programmes of study. They have very little idea of the nature and culture of the workplace and therefore they find it difficult to adjust. Graduates with work experience are more likely to gain employment after graduation than those without (Pedagogy for Employability Group, 2006). The value of work-related knowledge experiences is stimulating the employability of graduates (Lowden, Hall, Elliot & Lewin, 2011). The requirement of students to gain work experience seems to be a widely accepted fact among employers. The universities which have excellent track record have a similar line of thinking and have staff dedicated to help students to involve with some form of work-related learning. For many students this will not only allow them to develop the professional skills expected in all graduate recruits, but may also allow them to think about how the theory and knowledge they are gaining through their degree studies can be related to the real world. They will also be able to incorporate real-life experiences into their studies and expectantly see how the theory and real-world experience can contribute to their overall understanding of their academic discipline.

#### 2.2.1.3 Degree Subject Knowledge, Skills and Understanding

This has always been and remains at the heart of CareerEDGE. Many students come to university to learn about a particular subject and to gain work within this field. Some pursue their studies since they are passionate about developing their knowledge and understanding of the subject. All of us want our students to gain the most from their studies, to generate a love for learning and gain the best degree they can.

#### 2.2.1.4 Generic Skills (Including Enterprise Skills)

Generic skills approach alone is insufficient to do justice to the much broader concept of graduate employability (Tomlinson, 2012). Employers do understand the language of skills and are often quite specific about the skills they expect to see in graduate recruits. We do not provide our students any skill or training which would equip them to face the recruitment process and interviews while at university. Various generic skills which are listed by employers as vital in graduate recruits, such as communication, team building, problem solving, and digital literacy are the core skills of engineering graduates. The 'enterprise skills' such as creativity and innovation, are also skills that help students to make the most of their academic studies. They can develop these skills within the higher education curriculum. The student are able to see how they are developing the skills and competencies which the employers are looking for and will be able to offer evidence of these when applying for work experience opportunities and graduate jobs.

#### 2.2.1.5 Emotional Intelligence

Emotional Intelligence is one of the most debatable elements within CareerEDGE. Emotional Intelligence aptitude is something that has a noteworthy effect on relationships and well-being (Mayer, Roberts and Barsade, 2008) and as such earns a place within any model of graduate employability. This is a desirable attribute for probable leaders (Walter, Cole & Humphrey, 2011) which many graduates aspire to become. Emotional Intelligence is concerned with how people observe, comprehend and accomplish emotion. A graduate who is incapable to pay devotion to their own and others feelings, understand those feelings and manages them effectively, is likely to experience difficulties in their personal relationships and their professional relationships with colleagues, managers and customers. As a result, it is important to make students conscious of this and help them develop their ability in this area. Any action that inspire students to work together, communicate effectively, and converse with each other and reflect on their learning

experiences, can be used to develop emotional intelligence ability. There are many opportunities to include such activities in higher education curriculum and research which make it possible for students to improve their emotional intelligence ability together with confidence in that ability (Dacre Pool and Qualter, 2012). This can be helpful to include activities in other related areas such as diversity and cultural awareness, both of which will equip the students to evaluate how one's words and actions impact the feelings of others.

### 2.2.2 Reflection and Evaluation

Reflection and evaluation provide students with the chances to gain the necessary skills, knowledge, understanding and personal attributes through activities related to employability, which is noticeably of great importance. Without proper opportunities to reflect on these activities and evaluating them, it is unlikely that this experience will transfer into learning. This type of reflective learning often takes the form of written learning or reflective journals but could also include audio, video and e-portfolios. Reflection can help a student to gain employment by providing means by which they can become aware of and articulate their abilities. Then, additionally it is an ability that will assist them in their employment and contributes to lifelong learning skills (Moon, 2004). The procedure of reflection and evaluation that our students are able to develop, improves their self-efficacy, self-confidence and self-esteem which are crucial links to employability.

## 2.2.3 28 Statements of the Career EDGE Model

The study has used the Employability Development Profile (28 statements) of Career EDGE model. This can give an idea of Career model. The five elements (Career Development Learning, Experience, Degree Subject Knowledge, Generic Skills and Emotional Intelligence) are divided into different statements or variables. Each statement gives a clear picture about each factor. This can be given in table 2.1.

**Table 2.1**

**Employability Development Profile**

| | **Career** Development Learning |
|---|---|
| 1 | I know what kind of work would outfit my personality |
| 2 | I discern about what is required factor for me successfully sort of job I want to do |
| 3 | After my graduation I know what I want to do. |

| | |
|---|---|
| 4 | I have familiar with where to find out information about the employment that interest me |
| 5 | Apart from money, I Know what I want from my working Life. |
| | **Experience Work/Life** |
| 6 | I have lot of work experience |
| 7 | I can explain the value of my experience to a potential employer |
| | **Degree Subject Knowledge** |
| 8 | I am satisfied with academic performance |
| 9 | My academic performance so far is in line with my career aspirations |
| | **Generic Skills** |
| 10 | I have good oral communication skill |
| 11 | I am good at making presentations |
| 12 | I am confident to my writing communication skill |
| 13 | I work well in a team |
| 14 | I have good time management skill |
| 15 | I work well independently |
| 16 | I am good at solving problems |
| 17 | I have good planning& organizational skill |
| 18 | I am confident to use IT |
| 19 | I satisfied with my level of numeracy |
| 20 | I am prepared to accept responsibility for my decisions |
| 21 | I am able to adjust easily to new situation |
| 22 | I have good understanding on how business operate |
| 23 | I am good at coming up with new ideas |
| 24 | I can pay attention to detail when necessary |
| 25 | I am always open to new ideas |
| | **Emotional Intelligence** |
| 26 | I am good at working out what other people are feeling |
| 27 | I am able to manage my emotions effectively |
| 28 | I am good at knowing how I am feeling at a given time |

## 2.3 Review of Literature

A review of related literature is an essential aspect of any investigation. There are a number of studies focusing on various aspect of employment and employability of engineering graduates at various points of time by researchers in national and international level. In this section, we present the review of the existing studies among employment and employability potential of engineering graduates.

### 2.3.1 Issues of Employability

In this section, the employability issues of the different graduates especially engineering students are discussed. Employability constitutes a lifelong process and it is

questionable in every country. In India, the employability levels of graduates are low. Lack of skills creates deficiency in the level of employability. This section helps to identify the perception of employability among graduates and employers and the important skills required for employability. The reviews on employability helped the researcher to identify the different factors and attributes that are related to employability of graduates. It helps one to know about the awareness of employers and the employees towards employability skills. The factors affecting employability of engineering graduates in Kerala is one of the important objectives of this study. Hence, the reviews on various literatures on employability make an effort to classify the idea of different studies.

**Clark (1973)** dealt with the idea of the spot employment trends and assessment based on factual notions. He explained that many graduates have failed to find employment. He analyzed the employment trends of different categories. This study provides an understanding of graduate placement so that the educational system could be controlled better.

**Landis and Svestka (1983)** observed that demand and supply of engineering manpower must balance the economic growth. They concluded that preliminary discussion of the balance between supply and demand can have no prediction for the future. They found out that the preliminary analysis of the balance between supply and demand indicated a continued growth at the historic rate of 3.17 per cent during the period 1963-76. It revealed a slight imbalance as a small portion of the graduates were unable to find engineering job.

**Watts and Johnson III (1984)** brought out that private business may be an area of growth for sociology graduates. The main finding of the study is that graduates have a better reputation in the eyes of those who employ them than those who do not. The study explained the difficulties in making the graduate student employable according to the modern standards. The employment prospects of sociology students are discussed in this study. The respondents of this study identified the activities which are beneficial to make them employable through various skill development activities.

**Sivadasan (1984)** analyzed the utility pattern of engineering graduates in Kerala, specifically evaluating the magnitude of unemployment among engineering graduates thereby understanding their absorption in various public and private industrial sectors and establishments and their utility pattern. The study found out that 56.90 per cent of the total

employed engineering graduates are employed within the state and the remaining 43.10 per cent outside the state.

**Mason (1998)** in his study stressed the viewpoint of employers about employability. The study explained that, possession of the skills, knowledge, attitudes and commercial understanding will support new graduates to make creative assistances to structural objectives quickly after the initial stages in the job. He explained that demand for graduates in engineering and science disciplines require appropriate work experience and evidence of commercial understanding which is the by-product of commercial pressures.

**Chan (2000)** found out that employability is conceptualized as a multidimensional form of work which is actively adaptable enabling workers to recognize and understand career opportunities. He explained that an individual is employable to the extent that he or she can parlay personal factors effectively to negotiate environmental demands. He said that there are more studies which elaborate the environmental part of work willingness and emphasize the context of adaptability and the willingness of the individual to change as expected, in order to survive and grow in the long-run.

**Knight and Naylor (2000)** found out that the students who are regularly absent during the class hours lack enough academic competence compared to those who attend the lectures. The academic ambiences that students get in the class room equip the students not only for the academics but to impart leadership qualities inherent in them. This will ultimately shape them for better employability in the future.

**Yadav *et al*., (2002)** analyzed the issues of vocational education scheme at the graduate level. The study found that there is a mismatch between supply of and demand for graduates who have undergone the vocational courses. This study discussed the nature and objectives of vocational courses and realized the present day context by evaluating four different universities and found that the vocational courses had practically failed to achieve the employability. The study recommends modifications in the teaching methods, implementation of proper mechanism for monitoring and evaluation and introduction of new measures to develop employability.

**Prakash and Gupta (2002)** in their article examined the labour market trends of late 1990's. It also explained the perspective of reorientation of courses. The study also gave the idea that there is a greater interaction between industry and the training institutions and identified the qualitative factors to improve the training systems of ITI's. It included

curriculum modification, practical training, training of trainees and career development for teachers.

**Chhikara and Singh (2002)** in their study dealt with the role of human and non-human inputs in planning, executing and managing the vocational training programmes. They observed that systematic training of trainers generates an increase in income and enhances employment generation. This study provided broad functional framework for employment generation to be efficient and effective. The role of AJSS (*Avinashiligm Jan Shikshan Sansthan*) in providing knowledge, imparting skills and developing confidence in trainee, is explained in detail.

**Knight and Yorke (2003)** found out that skills plus framework explains the need for complex learning in undergraduate programmes to promote employability. Employability can be embedded in any subject curriculum without compromising academic freedom or stakeholder expectations of current academic values. They used USEM model and its feature is that its pedagogic approach does not force academics to compromise the subject specific understanding and it enjoys large scale support from academic community.

**Fugate *et al*., (2004)** accentuated the employability as a form of specific pro-active workforce adaptability. The study bases itself on three dimensions. First one is cognitive compass that motivates one to actively adapt in order to realize opportunities which is matching to one's career aspiration. Second dimension is willingness and readiness to change personal factors to meet the demands of the situation. The third explains the awareness about career opportunities with which is further enhanced through social networking skills.

**Grip *et al*., (2004)** in their study gave an understanding of employability of the labour force using three attributes measured at levels of willingness and capacity of an individual. The attributes were: mobility (changing jobs and organizations), training (skill enhancement), and functional flexibility (changing shifts, working beyond job description).

**Goel (2006)** analyzed the competencies of engineering graduates required for gaining better employment. A comparison was made between the accreditation agencies of various countries and this study inferred that engineering educational pattern followed by US, UK,

Australia, Japan and Singapore accreditation agencies emphasize on outcome-based approach. These students are trained to compete globally in the job market. This study suggested modification for the engineering curriculum as per the demand of employers and technological advancements. This study pointed out that apart from institutions the students should also take self interest in developing these competencies.

**Arocena *et al*., (2007)** analyzed the effect of promoting worker's employability on labour productivity. They used simple efficiency –wage model. It included the employer's decision to provide opportunities for enhancing employment prospects of workers. They used alternative indicators of workers' effort. One is that the number of voluntary suggestions made by workers and other is absenteeism. They clearly explained that improvement of workers' employability prospects increases the labour productivity. They used Spanish manufacturing workers as sample. They found that there is a positive relation between workplace and employment prospects of workers.

**Paranjape (2007)** in his article found out the linkages of certain employability criteria which is concretized with various parameters. The indices are examined with the help of Kruskal-Wallis test based on various background variables including academic inputs and cost of education. He uses the binary logistic model using dependent variables for employability and nine explanatory variables. Samples were collected from Mumbai during 2001-02 and stratified two stage sample design was adopted for the study. He observed that there is marginal increase in the incidence of high employability while moving from non-metro to metro regions. Faculty and mother's education have significant marginal effect on employability in the metro regions.

**Spinks *et al.*, (2007)** studied the skills and attributes required by engineering graduates for the present and for the future job market. The data was collected from twenty seven industrial experts belonging to large scale organizations and small and medium sized sectors in UK. The outcomes exposed that technical skills such as theoretical understanding, technical knowledge and practical application, personal skills are expected by the industries of UK from an under graduated engineer irrespective of various engineering disciplines.

**Saravanan (2009)** explained about the perception of students and placement officers regarding 'employability'. The study has also made an attempt to explain how these skills could be applied to the work environment. The study was concentrated on two groups of

respondents, namely, the placement officers and the engineering students. Qualitative analysis was used to carry out the study. The study also discussed about its application in the work environment. Seven skills namely communicative skills, critical thinking skill, team working skill, lifelong learning skill, entrepreneurship skill, ethics, moral and professionalism skill, leadership skill, were used for the study. The study recommended two models for incorporating these skills in the engineering curriculum. First model is 'stand-alone subject model' in which student pursuing engineering course and interested in developing skill could be given an opportunity to study skill development course as an additional course and is in no way related to the main courses. Second model is 'embedded model' in which soft skills will be incorporated in the teaching and learning activities across the curriculum. This model includes activities such as questioning, class discussion, brain storming team work, presentation, role play, project, field work and site visits etc. The study suggested that the identified skills need to be incorporated in Indian engineering curriculum to develop employability of students.

**Shekhar *et al.*, (2010)** observed the students' perceptions and expectations regarding the institutional facilities offered by the engineering education institutions in India. The hypothesis stated that there is significant difference between the perceptions and expectations of students regarding the quality of services rendered by engineering education institution. To measure the gap between expectation and perception of the students, service quality tool was used. The result found that the negative quality gap between perception and expectation reveal that the students are not satisfied with the services offered by the institution. The study displayed that the factor like professionalism, integrated education, facilities, responsiveness, empathy would minimize the gap between perception and expectation of the students.

**Scott and Yates (2010)** in their study on utilizing successful graduates for improving the quality of undergraduate engineering detected the capabilities that were seen to be most important for successful engineering practice during the first few years after graduation. This was a study of engineering graduates who were accepted as high performers by their work supervisors. The study involved 20 graduates from different universities working in seven companies covering electrical, civil, mechanical, telecommunications and environmental engineering. They found that technical expertise is a necessary capability for successful practice.

**Wittekind *et al.*, (2010)** pointed out that employability is a common factor and it is important for an individual in coping with job insecurity. There are many models developed to determine employability. This study intended to analyse the core determinants of perceived employability. They used multi-level analysis and taken four companies of Switzerland as models. They found that education, skill development, current level of job-related skill, willingness to change jobs were significant predictors of perceived employability.

**Nair *et al.*, (2011)** found out that the quality of engineering education can be enhanced by utilizing student feedback. This study outlined the utility of a student experience survey which can be illustrated in a faculty of engineering. They emphasized that such a questionnaire may not be effective without assurance of the university. Faculty management and academic staff must act upon the information provided by the students. It also stressed that students must be informed of and must also see the evidence of such action; or else they would become distrustful and indifferent about future surveys.

**Kumar and Mishra (2011)** found out that changing business environment has brought about a paradigm shift in employer-employee relationship. This study dealt with the idea of employability and explained the development of an instrument. They used exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) of the employability skills scale. Both these factors fielded a nineteen items six factor model. The study found out that the employability skills can be measured using the instrument on six dimensions like skill up gradation, career growth talk-orientation, blue eyed boy of bosses, professional networking and concern for time and love for challenge.

**Pillai *et al.*, (2012)** conducted a study on the industrial training programme at the university of Malaysia which explained the issues that need to be addressed in order to develop the employability skills of graduates. They also examined the self-rating of skills and industry's rating of the trainees. They concluded that most of the students were prepared to face the world of work. Industrial training programme serves as a vital yardstick in gauging undergraduates' marketability and employability as they grid themselves for the world of work.

**Pradela (2012)** investigated the aspiration of students and the factors which were responsible for enhancing the employability of graduates. The study observed that aspiration of the students consisted of parameters related to personal details and academic

details of individual students. Descriptive analysis was used for the study. The study concluded that majority of the students would like to enter into the job market without continuing their higher studies. The study highlighted the fact that only very few universities in Poland offer career service programme to their students and most of the universities have failed in doing it. Career service is a programme which enables students to understand their own abilities thereby preparing them to enter into the job market. The study found out that career service serves as a platform between the graduates and employers. The study recommended that in spite of teaching, the universities should also turn into career services for enhancing graduates' employability level.

**Shukla (2012)** analyzed the employability skill among engineering students of Bhopal. The study used the hypothesis that there is relationship between core skills of the students (technical skills, computer literacy, hands in laboratory, subject knowledge, understanding of concept, facts, principles and theories, breadth of knowledge, applying knowledge to practical situation and up to date subject knowledge) and high order thinking skills (learning, reasoning, creativity, problem solving and decision making). Pearson's correlation coefficient was calculated to study the relationship. The result revealed that students who are good at their core skills were not found to be good in their high order thinking skills. The findings exposed that students who are good in their personal skills are also found to be good in their basic academic skills but they do not possess sufficient employability skills. For enhancing the employability of graduates, the study suggested that engineering education should be modified by introducing practical industry-oriented curriculum.

**Jackson (2013)** observed that graduate employability is measured in basic terms such that whether a graduate has secured a job or not within the first six months of graduating is estimated. He observed that the graduate is in fact using the skills, knowledge and understanding gained during their degree studies and found out that graduate employability is multifaceted and encompasses academic performance, career management skills and labour market awareness.

**Ajit (2013)** in his study found out the factors impacting the employability of engineering graduates in Chhattisgarh. According to the study, the means of the variables, domain knowledge, empathy, communication skills and managerial ability have significant impact on the employability of engineering graduates. The study explicated that the independent

variable ‘motivation’ has not been observed to have made any important influence on the employability of engineering graduates. Regression analysis was used to analyse the data.

**Chithra (2013)** studied about the awareness of employers as well as the employees towards employability skills required for entry level engineering graduates in multinational software companies. This study is an exploratory study. Two sets of questionnaires were developed to assess the perception of skill set required by employers and graduate students. The study revealed that there is significant difference between the perception of students and their employers. According to this study, the students with work experience have better awareness of the employability skills than the students with no work experience. Enhancing the skills and application of knowledge through specific training will enable the workers to perform their jobs in the best possible manner and that is the need of the hour.

**Mehta (2013)** concentrated on the employability aspect of Gujarat rural labour force. He pointed out that lack of higher education and skill formation affects the choice of occupation and indicated that to increase the capability of rural workers there is a need for skill development. This study deals with extent to which the labour force possesses the capability for full time employment. He found that during 1990’s the decadal percentage of rural main workers fell by nearly 6 per cent though proportion of marginal workers in rural population rose from 9 per cent to 12.2 per cent.

**Iulianaparvu *et al*., (2014)** studied about the set of skills, knowledge and competencies expected from the graduates in financial accounting and management. The findings disclosed that the significant proportion is held by policies that are related to involvement of higher education institutions in increasing the employability of the future graduates. This is done by developing academic programs based on the development of competencies and skills necessary for the labour market. The global and national studies on multiple skills are expected by employers from the university graduates in economics too.

**Shah *et al.*, (2014)** in his study brought out the present scenario of market expectations about the management students and the factors affecting their employability. The statistical tools used were exploratory factor analysis and ANOVA. The study indicated that major factors which affect the employability were analytical skills and self-understanding, general management and work culture, leadership and problem solving ability and

communication. The study recommended that, the management institutes should start repeated training and workshop programs to make known the students about the current need and market expectations by the different employers of different sectors.

**Durrani *et al.*, (2014)** studied and explored the role and importance of numerical skills in graduate recruitment within a variety of occupation sectors. The study revealed that, the employers give importance to the numerical skills of the graduates and the extent to which employers use the numerical tests in graduate recruitment. Many employers resort to variety of tests to find out different kinds and levels of numerical skills for recruitment procedures.

**Madlani (2014)** in his study presented the meaning of employability skills, in order to understand the importance of skills, to review the requirements by the firm towards employability skills and to find out various methods for developing employability skills. The study aimed at finding solution for the problems confronted with the students as well as teachers. Data has been collected from the students, teachers and organizations to find out their expectations about employability and the required skills. The study pointed out that, many training institutes can be initiated by the university in which the curriculum design will be upgraded as per the industry needs.

**Prasad *et al.*, (2014)** found out the employability skills among aspiring engineering graduates. This study also evaluated the CTEEP (Corporate Training and Employability Skill Empowerment Program) and STEP (Student Training and Empowerment Program). The study resolved that, peer group impact and personal experiences play a key role in emerging skills. Focus group discussions and professional networking can be an assistance to attain employment faster. Continuous interview attempts and answering updated questionnaires related to technical aspect help the graduates to attain and sustain corporate employment.

**Gowsalya and Kumar (2015)** pointed out the employability skill of final year MBA graduates and suggested the factors of employability skills for them. Four independent factors such as learning self-understanding, general management, and work culture, leadership skills and computer skills have been identified to make a significant impact on the employability skills of management graduates.

**Shalini and Jegan (2015)** explained the skills required for employment purpose among fresh engineering graduates. Inferential statistics was used for the study. Tools such as ANOVA, t-Test, Chi-Square, Regression and Factor analysis were used for the study. They selected three districts and found out how various factors influenced employability skill levels of students. They disclosed that most of the respondents were lacking various skills especially communication and innovation.

**Kaushal (2016)** examined the importance of skills and the need of students to be aware of skills they possess and found a gap between academic programmes for engineering students and industry skills requirements. This study observed the role of academics in filling their gap by acting as facilitators in three step process (awareness, self-analysis, & acquisition) and concluded that the combination of both employability skills and engineering degree should equip students to meet the high expectations of the employers. The study also found that skills are prerequisites for any engineering student.

**Franklin and Dhiva (2016)** conducted a detailed study on employability skills of the students in information technology industry in Tiruvallur district. This study identified the skill gap of students who wish to join information technology industry and the expectation of the employer. The study stressed that there is a strong need for awareness among the Indian graduates to know the employability skills required by the global talent market. The research showed that the students with work experience have better awareness of the employability skills than the students with no work experience.

**Attri (2017)** in his study focused on the skill development as a vital component for efficiency and found out that productivity is a major source for the development of nation. The study also explained that the opportunities for employment come with integration of education and skill development. This article stressed the importance of the English language and explained how it acted as a catalyst in providing employment opportunities. The paper analyses the relation between communication and employability and explicates how effective communication skill equips a person to get better employment opportunities in present world.

Certain management philosophers like Schneider, and Otto (2009) and Saunders, Venetia; Zuzel, Katherine (2010) have extravagantly clarified the different phases and

types of employability that exist. Kotter (1996), Shultz and Olson (2013) observed that, if a person maintain employability, individuals need to reply to constant modification. Many factors such as globalization and the rapid growth and evolution of technology have impacted the type of skills and aptitudes that are needed to be actually employed in today‘s organizations. It explained that more sectors are coming up wherein rapid technological advancements have transformed the custom in which organizations operate.

### 2.3.2 Issues of Employment, Unemployment and Underemployment

This section deals with the employment, unemployment and underemployment issues of the graduate students. Several authors have extensively dealt with the problem of unemployment and under employment. The engineering graduates were experiencing unemployment and under employment due to low quality in the education system, stagnation in the labour market, labour market imbalance and over supply. The shortage of employment opportunities made issues of unemployment worse among engineering graduates. Hence, these issues are specifically explained in this section.

**Ilchman (1969)** analyzed the graduate unemployment problem in arts, science and commerce. He pointed out that levels of education correlate closely with the kinds of employment offered and the incomes aspired to, in India. He also explained about education expansion of graduates. In this article he concluded that increasing number of graduates are unemployed and employability of graduates remain high. A very high percentage of graduates are employed in clerical and administrative posts in the public sector.

**Sharma and Apte (1976)** explained the pattern and incidence of unemployment among the educated. They examined the pattern of involuntary unemployment in India. In this article the first part analyses the magnitude of the problem at all India level and regions. And second part detailed the incidence of unemployment, by faculty and regions. The employed degree holders in rural areas will remove the unemployment problem. Employment oriented vocational education will not create incidence of unemployment. According to the authors, incidence of unemployment was the highest in West Bengal. Checking the growth of higher education will help to remove the regional imbalances in education.

**Burdett and Ondrich (1985)** indicated that there were certain favorable shifts in labour demand after job search. These shifts increase the reservation wages and do not necessarily decrease expected unemployment spell durations. The study was based on the job search theory and had been restricted to the case where unemployed workers perceive changes in labour market conditions as they occur. They conclude that wage offer density is long concave and under this condition a downward sloping short-run Philips curve is the result that we get.

**Paul (1988)** found out that there exist spatial and temporal variations in unemployment and underemployment. The study was based on NSSO (32nd) and (38th) rounds survey data in rural India. He examined the unemployed using different characteristics like occupation, skill, education, level of consumption expenditure and age. The main problem of underemployment is the underutilization of labour time and incidence of the underemployed in labour force. The rates of unemployment and underemployment vary from state to state. This article gave the idea that job opportunities for women are limited in rural India and rates of unemployment for women are greater than men. Levels of education had been affecting the unemployment rate too.

**Jensen (1989)** made an attempt to study the unemployment and labour market regulation order and found out that it was a crucial issue of the welfare state. He selected four states of the countries- Denmark, Sweden, Britain and Italy. In his article he analyzed how the configuration of employment and unemployment policies in turn has affected the further development of the labour movement. He explains the relation between labour movements and specific welfare state policies as one with reciprocal determination. The problem-oriented approach has been selected for this project. He concluded that there is a connection between the character of the labour movement and structuration of wage earner interests policies function as a factor for the stratification of workers.

**Mathew (1995)** found out that Kerala's educated unemployment had increased at an alarming rate. Educated unemployment was more acute in rural sector. Relative oversupply of arts and science graduates is one of the major factors contributing to educated unemployment. He observed that duration of waiting period (interval between a person's entries into the labour market on completion of education) has been considered as an index of the gravity of the current educated unemployment. He also pointed out that the

wait for regular employment is primarily a loss of potential income. The flourishing educated unemployment had led to a steady decline in the real earnings.

**Ruiz-Quintanilla and Claes (1996)** analyzed three forms of youth underemployment i.e. part time employment, temporary employment and unemployment using longitudinal analysis of interview data during the years 1988 and 1990. He selected six European countries Belgium, England, Italy, Portugal, Spain and Netherlands for his study. They pointed out that organizational and societal factors appear to have had greater influence than behavioral variables such as job search strategies and demographic variables such as gender and age. They used dependent and independent variables to measure the underemployment and probit analysis using the statistical package for Unix is performed to test the hypothesis.

**Nair (1999)** made an attempt to know the phenomenon of labour shortage in rural Kerala. He found that rural unemployment is rising in Kerala and there is a shortage in agricultural labour too. The study also focused on paradoxical behavior of rural labour market in Kerala. He concluded that there are several indicators for increasing tightness of labour market and money wages and real wages have rising promptly.

**Chaubey (2000)** pointed out the issue of youth unemployment in the overall context of labour force participation. He made an attempt to consider the employment and unemployment scenario in terms of distinct categories of rural-urban, male-female, and educated-uneducated perspective. In this study he explained that low level of literacy is responsible for low employment and sometimes it generates frustrations among the youth. Various programs were initiated by the government to remove the unemployment of the youth. This study concluded that youth are unemployable because they lack skills required by the market. Education and training are the remedy this problem.

**Dooley *et al*., (2000)** examined the National Longitudinal Survey of youth for the years 1992-94. They pointed out that adverse employment change resulted in a significant increase in depression. They found that both unemployment and inadequate employment affect mental health and greater efforts are needed to monitor the extent and impact of underemployment. The study used Ordinary Least Square method to test social causation hypothesis. The study found that there is sequential reciprocal relationship between psychological well-being and employment.

**Parthasarathy and Nirmala (2000)** analysed in their article the structure and pattern of youth employment and also examined the extent of unemployment and regional dimensions of youth unemployment. They focused the three time periods-1983, 1993, 1997. The growth of youth unemployment was found to be lower than that of overall employment. In the methodology analysis, state wise cross sectional data was used and variations in unemployment of states were evident. They concluded that in sector wise distribution in 1990's, the primary sector recorded negative growth rate. Both male and female in urban areas showed perceptible growth compared to 1980's. They pointed out that unemployment rates are positively correlated to levels of education. The educated unemployment among the youth is higher in rural areas compared to urban areas.

**Sunny (2000)** described that Kerala had the skeptical distinction of having the highest rate of educated unemployment. He explained that lack of employment opportunities in agriculture and industry, low priority given to employment generation and excessive importance to general education are the causes of unemployment problem. Entry of software technology, internet e-commerce and popularization of information technology will help the state to achieve huge educational opportunities and high literacy rate. The strong tradition of migration has helped the state to successfully tackle its unemployment problem.

**Sundaram (2001)** studied the employment & unemployment situations in the nineties. His outcomes display a decrease in the share and size of the work force in farming, communications, social and personal services. The worker population ratio of rural female is 3 per 1000 in 1993-94 and 8 per 1000 in 1999-2000. The study found out that there is an increase in the ratio for rural male from 8 to 9 per 1000 and for urban male from 22 to 24 per 1000 which is also marginal.

**Prakash (2002)** in his article found out that incidence of urban unemployment in Kochi city is high and there is high rate of joblessness. He used NSSO data and stratified random sampling method. The finding of the survey was that a considerable proportion of household in Kochi city is poor. Regular employed households have better housing facilities compared to self-employed households. The problem of unemployment is basically the problem of youth, as 73 percent of unemployment belongs to age group 15-24. The study also stressed that there is relationship between low income and high incidence of unemployment.

**Brynin (2002)** explained that there was widespread evidence that many workers have higher qualification than what is required for their job. He pointed out that increased labour market uncertainty would create over qualification. One of the main points that the author reminded was that the social demand for education was causing a boom in qualifications at the higher levels. It meant that the employers could not easily segregate between different visible skill levels thereby reducing the reward for such skill.

**Hirway (2002)** in his article, using NSSO survey found out that the situation of the workers showed greater flexibility. The time use survey conducted in six states in India showed that this technique is able to network the workers in a much better way than the conventional surveys. It indicated the enormous deterioration in the quality of employment in India. He clearly pointed out that the conventional surveys were not adequate to assess the economic participation of our population. The use of time use survey technique is necessary to collect reliable workforce statistics in the country.

**Iyyampillai (2006)** pointed out that reduction in employment was mainly due to competition in the output market. It had increased powers of capital, and market forces, and cutting down of wage bills. The modern machines require more qualitative workers to handle them and changed labour market conditions have forced the workers to use more of their energy for longer duration. He found that total volume of labour in the production process has not declined so much.

**Mitra (2008)** pointed out that labour market situation in India was pro-poor growth. His article tried to explain work participation ratio, employment status and labour productivity. He found out that there is a missing link between rise in economic growth and reduction in poverty. He explained that majority of the poor were unskilled. He argued that growth in job opportunities is at a sluggish rate in urban areas. Employment growth in agriculture sector has rejuvenated and it has contributed to the rapid growth. He also found that employment growth was sluggish during the initial period and later it picked up during the second phase.

**Sumitha and Duraisamy (2009)** analyzed the changes in the size, composition and growth of the work force in Kerala during the years 1993-94 to 2004-05, using aggregate NSSO data. The average unemployment growth in Kerala is lower than that in India. The share of primary sector in total employment has declined and that of secondary and territory sector's share are increasing. The available data also revealed a sharp growth in

regular salaried employment and a reduction in the share of casual labour in Kerala and India during the given period.

**Guha (2009)** examined labour market flexibility through an empirical study of neoliberal policy. This article attempted an empirical inquiry into the proposition that casualization of labour leads to higher output and employment growth. Using regression analysis he found that there is no positive impact on output and employment growth. The impact of labour flexibility has caused increasing contractualisation of labour force on output and employment for organized manufacturing sector.

**Kjeldstad and Nymoen (2010)** indicated the factors behind underemployment in Norway and the analysis based on labour force survey data. Norwegian labour market was strongly gender segregated labour market and their processes and characteristics of underemployment differed between male and female dominated labour market sectors. Underemployed men were predominantly and temporarily expelled from their jobs and women were excluded from longer working hour contracts in jobs. They used regression models and found out that women were underemployed four times than that of men.

**Baum and Mitchell (2010)** studied the difference between unemployment and hidden unemployment. This paper uses Australian survey to analyse the respondents' household income and labour dynamics. They pointed out that labour market has more complexity and also examined the marginal labour force and its differences in men and women. This article used the longitudinal data of two states and found that there are differences in their labour market outcomes and that these are further complicated with process for male and female.

**Dixit *et al*., (2011)** found out that unemployment was the result of educated youth because they wanted to get white collar jobs. They observed that lack of education and vocational guidance facilities were the factors which gave rise to the problem of unemployment. Competition for jobs was the main problem of unemployment. The educated youth choose or get jobs easily and others are rejected. Money making is the only motive of the youth in choosing their profession. They commented that each student must identify his or her capabilities and interest before taking up any course. Employability is a more serious problem and challenge to the entire educational system.

**Satyanarayana (2011)** attempted to analyze the increasing unemployment in India with special reference to the promotion of self-employment and decentralized manpower planning during the 6th five year plan to tackle the problem of unemployment. Self-employment programme which was more essential for potential entrepreneurs were identified. He pointed out that self-employment increased the economic progress of the country. He used the co-efficient of correlation to find out the relation between the two variables. He examined the effectiveness of Self-Employment for Educated Unemployed Youth (SEEUY) scheme in India.

**Bhirdika *et al*., (2011)** argued that toughness in the labour market influence the economic growth and it is the cause for unemployment. They found that bringing more flexibility to the labour market may set up more jobs and huge economic growth. This study also analyzed the link between labour market flexibility and trends in India from 1999-2000 to 2005-06. He pointed out that employment in territory sector has been increasing indicating increased role of services in economic growth. The link between employment and labour protection is weak.

**Ravi and Jeemol (2013)** studied about the employment vulnerability in the urban labour market. It has been defined with the help of various dimensions of employment such as size of the employment at the firm, place of work, type of work content and leave benefits. The study found out that workers are more vulnerable in Ranchi than Delhi. They concluded that high intensity of vulnerability was present in urban labour market and it is partially explained by the increasing "informalisation".

**Mehrotra, *et al*., (2013)** found that one of the biggest challenges in modern India is the creation of decent jobs in organized sector. This article tried to analyze the intensity of employment output growth through an examination of employment elasticity and potential outlay for employment generation during 12th plan period. The secondary and territory sector showed higher productivity compared to primary sector and changes in the formal employment during this period have been minimal. The organized growth in employment has been marginal.

**Shaw (2013)** made an attempt to use NSSO's 68th round and explained that over 9 million people found employment between 2009-10 and 2011-12. This article showed that the average growth in employment between the years of 2004-05 and 2011-12 remained low at 2.5 million per year. He concluded that the increasing workforce proportion is moving

to non-farming activities. In the labour force participation, proportion of male in both rural and urban areas was much higher than that of female. This article gave a clear picture that unemployment rates have been declining over the last decade in all categories.

**Kavita and Singaravelu (2014)** analyzed that unemployment in India is a serious problem. They observed the various reasons which result in unemployment and also gave remedies to tackle unemployment by way of population control and economic development. They pointed out that minimum wages may be increased to reach the goal of a decent pay for all. Both central and state government should provide sufficient financial support to reduce unemployment.

**Rangarajan, *et al.*, (2014)** analyzed that Indian labour market showed some improvement between 2009-10 to 2011-12 because in this period more employment has been created. They used different methods to measure labour force like Usual Principle Status (UPS), Current Weekly Status (CWS), Usual Principle Subsidiary Status (UPSS), and Current Daily Status (CDS). The rural and urban India witnessed a sharp decasualization of employment, especially of females. The tremendous educational development and income effect of the rural people lead to decline in female participation. The female participation tends to follow a u-shaped pattern. The women's labour force participation is falling, due to acquisition of skills, more opportunities and their increased participation in labour force.

**Modiyani, *et.al*., (2015)** gave an overview of unemployment situation among graduates. They pointed out that analyzing the graduate unemployment wants proper understanding of current situation of unemployment problem faced by the country. They studied about the Jalgaon city's students and found many problems like lower economic growth, student's life, suicide, increased rate of crimes among them. Those social issues negatively affected the Jalgaon students. They observed that the educated youth are facing many problems in finding jobs and explained that job opportunities are low due to the overpopulation.

**Mendolia and Walker (2015)** studied the relationship between effort and low self-esteem, external locus of control and risk of dropping out from education and labour market among the English youth. They used ordinary least square method and propensity score matching methodologies. There is a positive relation between high effort and diligence and long term life outcomes and negative relation between low self-esteem and

external locus of control. They focused on early dropouts from both education and the labour market between the age 18 and 20. Their results revealed that low effort, diligence and external locus of control are more likely be the cause for drop outs.

**Brown and Koettl (2015)** conducted distinguishing active labour market programs providing incentives for retaining employment, incentive for creating employment, incentive for seeking and keeping a job, incentive for human capital enhancement and improved labour market matching. This study concluded by providing a systematic overview of active labour market programs. The study suggested measures to overcome frictional obstacles to employment and alleviate structural imbalances by improving matches and adopting qualifications to employer's needs.

### 2.3.3 Issues of Education and Development

This section explains about the engineering education and its role in economic development. Here we discuss the higher education sector at international, national and state level, and its development over the years. This has helped the researcher to look deeper into the higher education system and engineering education. The core purpose of the section is to reiterate the role of education in economic development and the effect of education on different fields. Various literatures on education and development help us to understand how the education support economic growth of the nations.

**Jackson (1940)** examined the beneficial progress in engineering education. He dealt with the idea that engineering schools to put before their students the axiom that unpleasant events arise out of human errors. He saw magnificent improvement in engineering education during the last half century. Students in engineering schools were positioned in large cities and it gave them an outstanding opportunity of performance to the engineering faculties.

**Fisher (1976)** found out that education has a purpose of preparing the students for better employment. The educational qualification of younger generation are higher than that of older generation. The student is both an adult and a worker, who is engaged in liberal education system at the time of education. If the students earn a skill for a job while they are studying, it will help them to get employed. He also pointed out that in an educated society underemployment is the endemic.

**Bella (1981)** conducted a study on engineering education and pointed out that heavy class loads, poor equipment, increased administrative demands and support services are common causes for stress among engineering students. He explains the problems in engineering education in which sustained interdisciplinary dialogues are eliminated in order to maintain specialized technical and administrative tasks.

**Kuttykrishnan (1994)** pointed out the changes that has taken place in Kerala's educational development mainly primary, secondary, higher education. The professional education needs more quality in the State. Kerala faces many issues in the educational sector such as quality of education, educated unemployment, and exponential growth of parallel educational system. Kerala government adopted huge policy measures to inject the needed dynamism to education. Effective planning will help to improve the educational situation. He found that in the post-independence period more intensive attempts have been made by the state to develop education.

**James (1995)** analyzed the demographic transition which had some impact on Kerala's education sector. Kerala has been moving towards a self-financing educational model since late 1990s. He concluded that falling birth rate in Kerala will definitely have an impact on the educational sector. The number of teachers and schools are increasing day by day. The government has to take initiative to improve the quality of existing educational institution to help the future generation.

**Lyon (1996)** studied about women's higher education and its success in the last century. He analyzed the relationship between higher education and labour market experiences for women graduates using 3 European countries: Britain, Germany and Sweden. This study focused on women labour market situation in Europe which has made more gains in career stakes. The demand for skilled labour will bring more qualified women into labour market.

**Vasavi (2000)** while analyzing report of the Kerala education commission outlined problems of Kerala's educational systems. There is a bias on education and the discrimination is based on caste, religion, gender etc. Inadequate facilities, outdated syllabus, poor teaching learning methods disrupt the quality of education. He noticed that social position of women in Kerala are relatively low but literacy levels are very high. And language issue is one of the complicated factors. This article tried to discuss the different levels of educational problems and gave broad suggestions.

**Basu *et al.*, (2000)** tried to understand the distribution of literates across households. Literates of the household helped other members to become literate. The literacy status of a society leads to intra - household externality. It is an implication of the measurement for gender dimensions in literacy. This article pointed out the intra household externality helps to attain equitable distribution of literacy.

**Surendran (2002)** observed that Kerala has given high priority to liberal mass education and the main cause of educational crisis in Kerala outlined an inherently egalitarian educational system. It has increased the poverty, unemployment and inequalities. But Kerala achieved much progress after 1990s and there are more improvements in educational systems. Over the last 50 years, Kerala's education history reveals marvelous achievements in many fields. Girls dominated in higher education other than boys. He also analyzed that higher education is costly and private sector participation in education is higher in educational system. So, there must be proper checks over such institutions and the government must ensure standards and facilities of private institutions.

**Ramachandran (2002)** focused on the current status of educational facilities at different levels and analyzed the labour market signals which give various options to enhance the skill level of the labour force. He explained that after independence demand for technical manpower and technical education have expanded. The expansion of educational facilities and absorption of technical manpower, particularly engineers, had declined. He explained that the state required a robust manpower information system in order to reduce the mismatch of demand and supply for labour. In this article it is depicted that there are only semi-skilled labour force is available in India.

**George and Sunaina (2005)** made an attempt to explain the dynamics of change in the Kerala educational sector in the broad context. Many social and political forces have influenced the educational system of Kerala. This article gave a brief overview of developments in the state's education and explained its characteristics and issues. It has also indicated that the share of education in the state's budget is low and the state domestic product is growing. They concluded that Kerala education system required update and modernization.

**Yogish (2006)** analyzed the performance of education and economic development .The study gives a brief sketch of educational sector. He concludes that education gives necessary skill, knowledge, reasoning and confidence to make democracy meaningful.

Education can be seen as a global market opportunity and it is creating political awareness among the people. Expensive higher education, low quality, narrow coverage are the problems of educational sector in India. He found out that returns to primary education are higher, relative to returns to secondary education.

**Bhattacharya (2008)** studied about engineering education in India and the role of ICT. He found that the current engineering education in India needs to use ICT to spread the outreach of quality education to meet the requirement for such education within the country. Yet, mere delay of outreach would not automatically solve the basic need for 'effectiveness' of learning. Once the resource material is available widely, learning principles and instructional design guidelines need to be incorporated within the delivery system to create a complete learning experience for each student thereby allowing effective learning to take place. A change in the mind-set of teachers and students also needs to be achieved so that ICT-24 based education is accepted as a viable alternative and not a poor substitute to traditional education systems.

**Harikumar and Remadevi (2008)** observed that Kerala's educational system needed more development. Educated unemployment and underemployment problem lead to serious disequilibrium in the labour market. They explained that the educated people wanted to get more salaried jobs and also pointed out that employees used the educational qualification as a screening device. The study identified the existence of screening hypothesis. Main finding of the study was that there were over education and it was negatively related to earning of additional years of education. They pointed that the educational system needed structural changes which was to be tackled by the state.

**Nordin *et al.*, (2008)** dealt with the idea of the consequences of education-occupation mismatch. They pointed that income penalty for men decreases with work experience. A cross-sectional data analysis has been used for the respondents of 28-39 age groups living in Sweden in 2003. Mincer type income model was used to estimate and it clearly specified that income penalty still depend on mismatch in personal skills.

**Chevalier and Lindly (2009)** dealt with the idea that proportion of persons who enter UK higher education is doubled. This article analyzed the effect of the expansion on graduates and it focused on over education. Data was collected from 4502 UK individuals who graduated in 1995 from 38 UK higher education institutions. The survey conducted on 2002-03 showed that probability of over education has doubled compared with the pre-

expansion cohort. They found that there is heterogeneity in the probability of over education.

**Brown *et al.*, (2009)** found out the nature of engineering education focusing on an extensive historical study of engineering education in India. The study demonstrates how history of technology can provide revisionist framework by viewing historical contingencies through technological developments. It was in the post-independence era, that engineering colleges were established by the Britishers. It helped the Indians to work in subsidiary position under British rule. This article follows that history always influences engineering formations and its evolving manifestations and anxieties. They pointed out that engineering societies struggle with their own self identities.

**Deepa (2010)** in her article analyzed education sector of India and its progress in the last six decades. She pointed out the importance of education and explains education sector outcomes. India has large potential of human resources and technically qualified people. Some states have educational development and other states are not up to the mark. The progress of education sector in India was the result of a complex mix of demand side factors and supply side factor.

**Clark and Andrews (2010)** examined a study on primary engineering education about UK perspectives which was tentative in nature. This study identified three main concepts during the analysis of findings, each appropriate to primary engineering education. These were pedagogic issues which exposed the engineering disciplines within the curriculum and children's interest. The paper pointed out that to make a real difference to children's education we must encourage their engineering imagination.

**Jindal and Aggarwal (2011)** made a study on Engineering Education and Teaching Evaluation Based on SPSS in the state of Punjab. The study concluded that to make the teaching effective in engineering institutes the latest determinants must be used. The other important technique which made the teaching effective was the teaching assessment. As private institutes were already incorporating the above determinants and technique in the institute in comparison with the public institutes the latter need to step up towards these determinants and technique. In private institutes 80 per cent students believe that the student feedback is a must to ensure effective teaching. But in public organization 73 per cent students believed timely statement of result is the most important thing to make

teaching effective. Incidentally, in public institute most of the time results are declared late.

**Sharma (2011)** found out that India has strengthened the educational system, which influence the global economy. The article gives an idea about India's educational development and drawbacks and gives the policy implication to improve the educational situation. The study stressed the need for a job-led growth which is more useful to attain better quality of life. There is a need to give priority to strengthen higher and technical education.

**Balakrishnan (2011)** indicated that quality of people was important in beginning of new era and making transition. The Indian IT industry may pioneer solutions to India's bulky education challenge. He explained that India's education system faces a challenge of IT services revolution which demand skill and quality. After 1990's there were many changes in IT industry. IT industry was a success after globalization and it increased world's trade and spread prosperity.

**Vilanilam (2012)** observed that there had been many changes in educational situation during the period between 1947-2012. He viewed that in highly literate states of India, most of the workers were having higher degrees that were not needed for their job. It was because of the large size of unemployment situation and stiff competition for jobs. Many educational bodies has helped to make India a knowledge society. His opinion is that jobs were not delinked from degrees.

**Subbarao (2013)** brought out that the undergraduate engineering education has achieved great reputation between 1951 and 1961 through five Indian Institute of Technology (IITs). He found out that this achievement could not be extended to postgraduate engineering education at large. The poor quality of education leads to unemployment among the graduates. The rapid expansion of education system, executed without adequate number of qualified teachers, along with shortage of infrastructure and lack of autonomy in all aspects of educational system have deepened the crisis of unemployment.

**Aradhana *et al.*, (2013)** analyzed that the impact of education on labour market outcomes using various rounds of NSSO of India. The occupational destination had examined using both static multinomial logit analysis and structural dynamic discrete choice modeling. Global competition was the one of the causes of labour market changes. This study found

that increase in spending on education leads to increase in propensity of young people to get better jobs. It increased the propensity for workers to enter non-manual employment.

**Tilak (2014)** found that India's higher education experienced a very high rate of growth since the beginning of 1990's.This study gives the attention to the dangers involved in a high degree of dependence on private sector for the development of higher education in India. He also explained that an important form of privatization of public system of higher education is financial in nature. Privatization is not seen as an instrument to develop higher education but it seen as reflecting development of higher education and it aims to transform itself into a knowledge society.

**Visaria (2014)** explained that there was a linkage between education, population, and development. This study gives the idea of realistic manpower and expenditure planning of free and elementary education to all children between ages of 6 and 14. The article discussed about the issue of quality of education with focus on employability and skill formation. Sustainable development is necessary to provide good quality education including teaching employable skills. The education facilities in rural areas are highly skewed. The study also pointed out the role of teachers and facilities of educational institutions.

**Besant and Sen (2014)** discussed the socio-religious affiliations in determining the participation of higher education in India. They compared three rounds of NSSO data [55th, 61th and 66th] and tried to assess it by using limited data from different round with information on access to secondary school. In the methodology part, binary probit model using the measure of stock is explained. Higher education participation explores the role of supply-side constraints.

**Sharma (2014)** commented that rampant rise in the number of engineering institutions in the last two decades in India caused easy entry of aspiring students into engineering institutions. It provides excess manpower for industries. The quality of education in most institutions remains questionable. He explained that many leading institutions like IIT are credited with excellent undergraduate education. However, this achievement did not reach their postgraduate engineering courses. In this aspect, some of the issues arising out of quantitative growth of engineering education, are identified and found. The reasons for this condition was that employability skill among the engineering graduates are very low.

**Chatterjee (2015)** commented that education was one of the serious challenges of contemporary India. In a contemporary world literacy has grown but the quality of education has gone down drastically. This article gave the idea that there is large difference in the quality of education given by schools to the different segments of our society.

## 2.4 Summary

The chapter dealt with the theoretical framework of employability and review of literature. The study selected Career EDGE model to explain the employability model. It explained the chances of students to access the factors and broaden the capacity of the students and it results in progress of higher levels of Self-efficacy, Self-confidence and Self-esteem – the significant links to employability. Numerous theories and frameworks tried to measure the role and relevance of employment and employability of engineering graduates. The existing literature clearly pointed out the various issues relating to employment, unemployment, underemployment, issues related to education and employability. The study mainly focused on the engineering graduates and the factors affecting their employability . The review was divided into three sections and explained the various issues related to engineering graduates. The issues of the objectives dealt in the chapter were 1) Employability, 2) Employment, Unemployment and Underemployment and 3) Education and Development.

## 3.1 Introduction

Employment and employability are the two variables, which lead to the success of the development programs of the workforce. Employment is an agreement between the employer and the employee through which the employee will provide certain services for the job offered to them. Employability is the ownership by an individual of the qualities and capabilities mandatory to meet the changing needs of employers and customers and thereby help to realize his or her ambitions and potential in work. Unemployment is one of the main challenges of Indian economy and the alleviation of this problem is a herculean task.

This chapter undoubtedly gives an idea about the employment and unemployment status of the international, national and state (Kerala) scenario. The present study focuses on the employment and employability of engineering graduates. The chapter automatically overviews the situation of employment, unemployment and employability pertaining to the engineering field and also specifies the employability of the world and national level. It clearly illustrates the engineering education in the world, in India and in Kerala.

## 3.2 Employment and Unemployment Status of the World

Unemployment is one of the serious problems of every economy in the world. Educated unemployment is acute in most of the countries. Employment and unemployment are mutually and negatively related. Employment leads to increase in the efficiency of human resources and it alleviates the problems of human beings. International Labour Organization explicated the sector wise employment rate in the world. In 2017 the total sectoral employment was 3301 million. Primary sector employment was 94 crore, the industrial sector employment was 71 crore and the last service sector employment was 164 crore (World Employment and Social Outlook, 2017). Table 3.1 perceptibly gives the total employment rate in the world.

## Table 3.1

## Total Employment in World

| Year | Employment (Millions) |
|---|---|
| 2000 | 2775 |
| 2001 | 2780 |
| 2002 | 2783 |
| 2003 | 2792 |
| 2004 | 2800 |
| 2005 | 2806 |
| 2006 | 2812 |
| 2007 | 2825 |
| 2008 | 2836 |
| 2009 | 2850 |
| 2010 | 2872 |
| 2011 | 2921 |
| 2012 | 2946 |
| 2013 | 3000 |
| 2014 | 3015 |
| 2015 | 3027 |
| 2016 | 3200 |
| 2017 | 3450 |

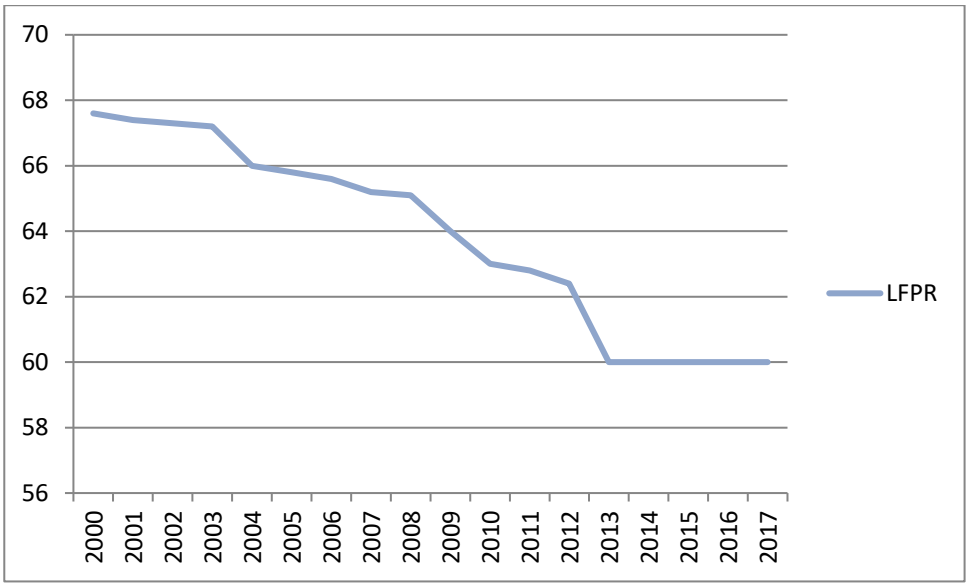
Source: World Employment &Social Outlook, 2018

Table 3.1 shows that every year, employment rate is increasing. Several factors lead to the increase in the employment rate. In 2000, the world employment rate was 2775 million and it had increased to 3450 million in 2017 (World Employment &Social Outlook, 2018).

Labour force participation rate is a measure of the proportion of a country's working-age population that engages actively in the labour market, either by working or looking for work. It is calculated by expressing the number of persons in the labour force as a percentage of the working-age population. The labour force is the sum of the number of persons employed and the number of persons unemployed (International Labour Office Report, 2018). Unemployment rate is indeed necessary to analyze the labour force participation rate because people classified as the unemployed according to the joblessness rate might not include dynamic members of the labour force.

## Figure 3.1

## Labour Force Participation Rate




Source: World employment social outlook 2018.

Figure 3.1 explores the idea that labourforce participation rate has a down ward trend. At first, it had high labourforce participation rate and then it declined and finally it had stable rate. In 2000, labour force participation rate was high and it was decreasing over the years and from 2014 onwards, labour force participation rate was stable and it was unchanging over the years.

The measurement of the labour force participation rate requires the measurement of both employment and unemployment. Coming to the unemployment rate of different countries, it is understood that every year unemployment rate was changing.

## Table 3.2

## Unemployment Rate ( Country Wise)

| **Unemployment developments, Country/region** | **2016 (%)** | **2017 (%)** |
|---|---|---|
| **World** | **5.7** | **5.8** |
| Developed economies | 6.3 | 6.2 |
| Emerging Markets | 5.6 | 5.7 |
| Developing economies | 5.6 | 5.5 |
| **Arab States** | **10.7** | **10.6** |
| Saudi Arabia | 5.5 | 5.5 |
| **Eastern Asia** | **4.5** | **4.5** |
| China | 4.6 | 4.6 |

| | | |
|---|---|---|
| Japan | 3.1 | 3.0 |
| Korea | 3.7 | 3.6 |
| **Eastern Europe** | **6.2** | **6.1** |
| Russian Federation | 5.7 | 5.8 |
| **Central and western Asia** | **8.9** | **9.2** |
| Turkey | 10.3 | 10.8 |
| **Latin America and Caribbean** | **8.1** | **8.4** |
| Brazil | 11.5 | 12.4 |
| Mexico | 4.1 | 4.1 |
| **Northern Africa** | **12.1** | **12.0** |
| **Northern America** | **5.1** | **5.1** |
| Canada | 7.1 | 7.1 |
| United States | 4.9 | 4.9 |
| **Northern,Southern,and Western Europe** | **9.3** | **9.1** |
| France | 10.0 | 9.8 |
| Germany | 4.3 | 4.2 |
| Italy | 11.5 | 11.4 |
| United Kingdom | 4.8 | 5.0 |
| **Southern-Eastern Asia and Pacific** | **3.8** | **3.8** |
| Australia | 5.7 | 5.5 |
| Indonesia | 5.6 | 5.8 |
| **Southern Asia** | **4.1** | **4.1** |
| India | 3.5 | 3.4 |
| **Sub-Saharan Africa** | **7.2** | **7.2** |
| South Africa | 25.9 | 26.0 |

Source: World Employment and Social Outlook – Trends 2018

Table 3.2 clearly specified that unemployment rate was slightly different in the country wise analysis. The rate of unemployment was remaining high. The rate of unemployed people increased to 3.6 million between the years 2016 and 2017. The world unemployment rate in 2017 was 5.8 per cent. In country wise analysis, South Africa had the highest unemployment rate (26 %) than other countries (World Employment & Social Outlook, 2017).

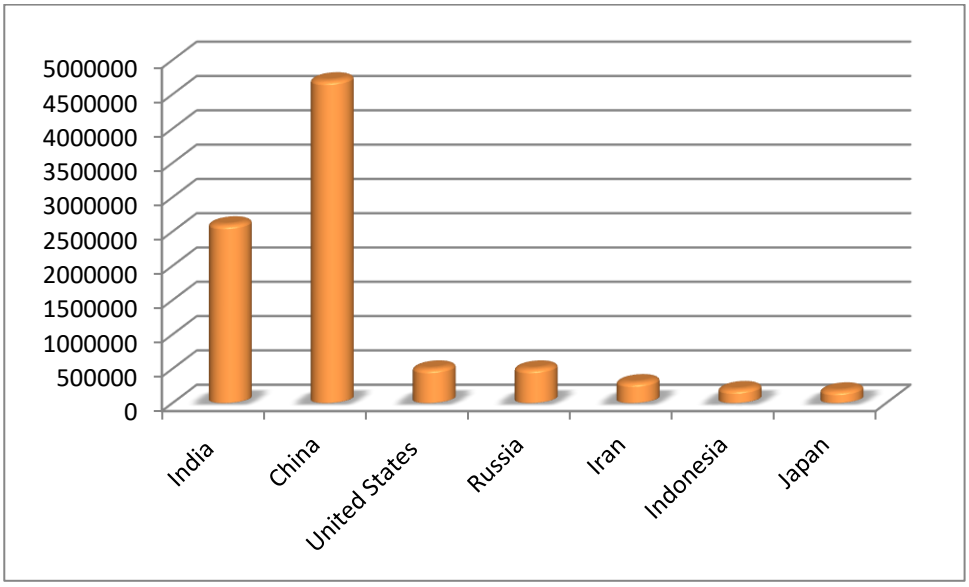
## 3.3 Engineering Education in the World

Emerging of engineering education changed the entire education scenario of the world. There is a clear cut mismatch between skilled labourers and those of available workers. Engineering education is an activity oriented and skill based education. Early stages of technical education helped to progress the foundation of engineering education. In every nook and corner of the world, engineering education has importance because it is one of the professional jobs in the world. Engineers play a crucial role in our societal

progress and they initiate economic development. The present students of engineering are the future experts who will exhibit the trained skills including problem solving element. The status of the engineering profession, provide prestige and influence to play a vital role in an increasingly technology-driven world while creating sufficiently flexible and satisfying career paths to attract a diverse population of outstanding students (Duderstadt, 2008).

**Figure 3.2**

**The countries with the most STEM graduates (recent graduates in Science, Technology, Engineering and Mathematics 2016)**




Source: World Economic Forum,2018 (Forbes Statista)

Figure 3.2, clearly specifies that Science, Technology, Engineering and Mathematics (hereafter STEM) graduates have become an attractive component in the wheel of global success and obviously China leads the world. The World Economic Forum reported that China had 4.7 million recent STEM graduates in 2016. India, another academic powerhouse, had 2.6 million new STEM graduates in 2016 while the U.S. had 568,000 STEM graduates (World Economic Forum, 2018).

## Table 3.3

## World Statistics of Engineering Graduates

| Countries | Number of Annual Engineering /manufacturing/construction graduates |
|---|---|
| Russia | 454436 |
| US | 237826 |
| Iran | 233695 |
| Japan | 168214 |
| South Korea | 147858 |
| Indonesia | 140169 |
| Ukraine | 130391 |
| Mexico | 113944 |
| France | 104746 |
| Vietnam | 100390 |

Source: World Economic Forum 2018/UNESCO Institute of Statistics.

As per World Economic Forum Report (2018) the number of engineering, manufacturing and construction workers are highly growing in the countries like Russia, U.S, and Iran taking the 1st, 2nd and 3rd position respectively.

## 3.4 Employability in the World

Globalization and technological expansions have changed customary work practices, with an additional shift in demand in the skills required by employers. The mobility of workers has caused the replacement of the permanent employment by non-standard, part-time, contractual and fixed-term employment (International Labour Office, 2017). After globalization, job market fluctuations created an atmosphere for the employers to have improved filling of the vacancies. Rahmat *et al*. (2016) have claimed that the main cause for unemployment is the absence of employability skills possessed by job seekers rather than lack of jobs. Emerging economies are working towards the improvement and expansion of their technical and professional education to cope with their economies' ever-growing demands (Singh *et al*., 2017). The aim is to go beyond academic achievements and attain a wide range of skills (Tan *et al*., 2010). In

Organization for Economic Co-operation and Development (hereafter OECD) countries 15 per cent of youth does not have proper education, employment or training. Even after the recessionary tendencies, the employment rate among the youth remains below its pre-crisis level. In multiple OECD countries, such as Greece, Spain, and Italy, the youth unemployment rate remains at stunning levels. Many of the young people who are employed are not using the skills they acquired during their schooling. The OECD Skills for jobs database provides detailed information about the skills that are in shortage and surplus in the OECD countries' labour markets. Youth unemployment is an issue in most parts of the world, often at higher rates than average unemployment (Youth Global Employability Report, by AIESEC, 2018). In the globalization era, sustaining competitiveness in labor productivity and improving employability of graduates posed unlimited challenges to Malaysia and many countries in the world (Quek, 2008). As per ILO report, there are a surprising 71 million unemployed young people all around the world. One of the reasons behind this can be the paucity of critical skills needed for a job.

## Table 3.4

## Countries Producing the Most Employable Graduates

| Countries | Percent |
|---|---|
| US | 40 |
| Germany | 34 |
| UK | 32 |
| Canada | 20 |
| China | 19 |
| France | 18 |
| Australia | 16 |
| India | 15 |
| Switzerland | 13 |
| Singapore | 12 |
| Spain | 10 |
| Italy | 9 |
| Brazil | 7 |

Source: Global University Employability Survey, 2018.

Table 3.4 shows the rate of highly employable graduates from different countries in 2018. The U.S had produced more employable graduates than any other country.

Second and third countries producing employable graduates were Germany and U.K respectively.

## 3.5 Employment Status in India

Employment structure of an economy is the normal instrument that can cause a change in inequality either way, i.e. an increase or a decrease in the inequality. Other economic instruments such as target group policies and programmes have a short term impact, but the redistribution through employment is sustainable. Since the governments function within the administrative and fiscal constraints, the targeted employment status cannot be attained.

**Table 3.5**

**Growth of Employment (1971-2011)**

| No | Year | Total Population | Decaded Growth rate of Population | Total Workers | Participation Ratio | Decaded Rise in Workers | Index of Total Workers |
|---|---|---|---|---|---|---|---|
| 1 | 1971 | 548159652 | ---------- | 180485006 | 32.9 | -------- | 100 |
| 2 | 1981** | 665287849 | 21.4 | 244604986 | 36.8 | 64119980 | 136 |
| 3 | 1991*** | 838583988 | 26.0 | 34131370 | 37.5 | 699526384 | 174 |
| 4 | 2001 | 1028610328 | 22.7 | 402234724 | 39.1 | 88103354 | 223 |
| 5 | 2011 | 1210193422 | 17.7 | 481743311 | 39.8 | 79508587 | 271 |

Source : Census of India 1971, 1981,1991,2001,2011.

** Excluding Assam

*** Excluding Indian Figures of Jammu & Kashmir.

The growth of employment scenario during 1971-2011 is presented in table 3.5. This table indicates the trend in absolute increase in the number of total workers and it is obvious that there has been a positive impact of economic reforms on employment.

From table 3.6 it is understood that there was lower growth rates in sector wise employment. A vivid picture of the sectoral share of employment under Usual Principal Status (UPS) approach is given in table 3.6.

## Table 3.6

## Sectoral Share of Employment (Usual Principle Status) in Percentages

| NSSO Rounds | Primary | Secondary | Tertiary |
|---|---|---|---|
| 43rd(1987-88) | 62.5 | 16.7 | 20.9 |
| 50th(1992-1994) | 61.7 | 15.7 | 22.6 |
| 55th(1999-2000) | 58.5 | 16.8 | 24.7 |
| 61th(2004-2005) | 54.2 | 19.4 | 26.4 |
| 66th(2009-10) | 49.92 | 21.78 | 28.3 |
| 68th(2011-12) | 45.99 | 24.26 | 29.74 |

Source: Survekshna1990, NSSO Various Rounds (43rd, 50th, 55th, 61th, 66th and 68th).

As per the NSSO rounds primary sector was declining, secondary sector and tertia share of employment of tertiary sector had increased at an alarming rate. Table 3.6 displays the various rounds of NSSO and the sector wise employment rate in India. Primary sector employment rate of 43rdround was 62.5 per cent but it was declining in 68th round (45.99 per cent). Nevertheless, secondary and territory sector have increased at an increasing rate.

## Table 3.7
## Labourforce participation Rate in India

| Sector | Male | Female | Person |
|---|---|---|---|
| Rural | 77.3 | 26.7 | 53.0 |
| Urban | 69.1 | 16.2 | 43.5 |
| Rural+Urban | 75.0 | 23.7 | 50.3 |

Source: Fifth Annual Employment – Unemployment Survey (2015-16).

According to Fifth Annual Employment – Unemployment Survey (2015-16), Labour Force Participation Rate (hereafter LFPR) was estimated to be 50.3 per cent at the All India level. This implies that 50.3 per cent of the persons aged 15 years and above were either working or seeking work during the reference period. In the rural sector, the LFPR was estimated to be 53 per cent whereas in the urban sector the LFPR was 43.5 per cent. Female LFPR was significantly lower as compared to LFPR among male. Labour-force participation rate is defined as the proportion of persons/person-days in the labour-force to the total person/person-days. These ratios are given in per 1000 of person or person-days.

**Table 3.8**
**Youth Unemployment Rate in India as per UPSS[2] Approach.**

| Sector | Male | Female | Total |
|---|---|---|---|
| Rural | 5.0 | 4.8 | 4.9 |
| Urban | 8.1 | 13.1 | 9.2 |

Source: Employment and Unemployment Situation in India, National Sample Survey-68th Round, 2011- 2012(Age: 15-29 years).

An essential aspect for economic development is Productive employment of youth. The UR (Unemployment Rate) of the youth is 4.9 per cent for rural areas and 9.2 per cent for urban areas. Similarly, the UR among the female youth is also higher than that of the male youth. Area wise UR data shows that 13.1 per cent of female are in urban area as against the male of 8.1 per cent.

## 3.6 Engineering Education in India

Technical education is essential for human life .The formal education system for technical education began to get attention from the period of the third and fourth decade of the 19th century under colonial rule (Mukherjee, 1964). India has much potential to be a worldwide technology leader. Indian business is challenging globally in software and even in areas such as automobiles, chemicals and engineering equipment. A critical issue for the future success of Indian industry is the growth of engineering education in India. Engineering education extends a wide spectrum from doctoral to first degree to diploma and to craftsman levels to meet the industrial and societal needs. Each level has its role (Keerthi, 2014)

Engineering is a profession focused towards the skill application of a distinctive body of knowledge based on mathematics, science and technology, integrated with business and management, which is acquired through education and professional formation in a particular engineering discipline (Bianca K. & Peter F, 2004). Engineering is contributing to developing, providing and conserving infrastructure, goods and services for industry and the community.

Engineering profession has been perceived as one of the most exciting professions in our society mainly because of its strong interface with the nation's development, society's upliftment and its direct impact on the improvement of quality of

[2] UPSS- Usual Principle Subsidiary Status.

life of our people. In fact, a nation's potential for progress and its capabilities for the attainment of national prosperity are judged primarily on the basis of its science and technology capabilities. The science and technology capabilities of a nation singularly depend upon the quality of human resource it produces in the areas of vital importance to nation's economy.

In contemporary years, undergraduate engineering education has been subject to a varying pace of change in the world. The black board, chalk and overheads still remain as the primary teaching technology of the engineering colleges, even though the advantages of information technology to improve efficiency and quality of communication are widely recognized by engineering professionals and researchers. As engineering colleges experience enlarged competitive pressures in preserving student's numbers and teaching quality, information technology becomes an area where colleges should explore in order to improve educational atmosphere and qualities. The role of information technology in supporting beneficial learning is to provide a source of information that can be accessed by students in a manner uninhibited by time and location. This allows students to acquire knowledge from shared information sources in a dynamic structure.

### 3.6.1 History of Engineering Education

Our study gives an intense picture about pre and post-independence period history of engineering education in India.

#### 3.6.1.1 Pre-independence period

The British rulers set up four engineering colleges in the four corners of India – Roorkee (1847), Sibpur (1856), Guindy (1794) and Poona (1854) to train the engineers needed for the civil and other engineering activities of the day . These four engineering colleges had a total enrolment of 608 students during 1884–85. Each had a glorious record, having produced some of the outstanding engineers of India. Another major step taken in the pre-independence era was the creation of the N. R. Sarkar Committee in 1945, which submitted a preliminary report recommending the setting up of four higher technical institutions with broad based education.( E. C. Subbarao,2013).

Based on the Wood's Dispatch recommendation, three engineering colleges were opened by the year 1856 in three Presidencies. The Calcutta College of Civil engineering was opened in November 1856 at Howrah, Bengal and its name was transformed to as

Bengal Engineering College in 1857 and it was affiliated to the Calcutta University. Later in 1880, it was separate from the Presidency college and shifted to Sibpur occupying the premises and building belonging to the 'Bishops' college. The Victoria Jubilee Technical Institute was started in 1887 at Bombay and offered licentiates in electrical, mechanical and textile engineering (Reddy,2015).

In the Madras Presidency, the industrial school attached to the Gun Carriage Factory became the Guindy College of Engineering in 1858 and was affiliated to the Madras University. The Indian Institute of Science, Bangalore, was established in 1909 by the House of Tatas and offered certificates and associateships in Electrical Engineering in the year 1915. The Banaras Hindu University was setup by Pandit Madhan Mohan Malaviya in 1916 and started degree classes in mechanical engineering, electrical engineering and metallurgy. Besides engineering colleges, separate colleges of technology, such as, College of Textile Technology, Serampore, West Bengal (1908), Government Central Textile Institute, Kanpur (1914), Harcourt Butler Technological Institute, Kanpur (1920), Indian School of Mines, Dhanbad (1926). Maclagam College of Engineering, Lahore (1930), University Department of Chemical Technology, University of Bombay (1934), and Alagappa Chettiar College of Technology, Guindy (1944) were also established in the pre-independence period(Reddy,2015).

#### 3.6.1.2 Post-independence period

At the time of Independence in 1947, there were only thirty eight degree-level and fifty two diploma level engineering and technical institutions with a total intake of 2,500 and 3,670 students, respectively. After Independence in 1947, it was understood that if India has to play the role effectively in the world, it should have a powerful economic and industrial base, which can only be achieved through effective planning and its ability to provide trained technical manpower. Implementing the Sarkar Committee recommendations, five Indian Institute of Technologies (hereafter IITs) were established at Kharagpur (1951), Bombay (1958), Madras (1959), Kanpur (1960) and Delhi (1961) as institutions of national importance by an Act of Parliament. After a gap of over three decades, the sixth IIT was established at Guwahati (1995) and the Engineering College at Roorkee was first made a University and then as the seventh IIT in 2001. In 2008, four more IITs were established at Patna, Jodhpur, Hyderabad and Gandhinagar and followed by four more at Ropar, Bhubaneswar, Mandi and Indore in 2009 making a total of fifteen

IITs (Kumaraswamy,2015). In the next tier of institutions, there were 20 Regional Engineering Colleges(RECs) which were recently renamed National Institutes of Technology (NITs) with Central Government funding and greater autonomy. There are a large number of State Government Engineering Colleges, often affiliated to a University and having a limited or no autonomy about curriculum, examinations, and granting of degree (E. C. Subbarao, 2013). To develop a good quality technical manpower it is necessary to promote economic and industrial development in a country. An efficient system of technical education and training are the keys to the development of technical manpower. A major development in the field of higher and technical education was National Policy on Education (NPE) of 1986 amended in 1992. NPE emphasized need for changing the technical and management education classification to excellently to deal with the management processes and quick growth of knowledge and advances in science and technology. Many official committees were set up to evaluate and refresh engineering education in the country.

### 3.6.2 Major Committees and Recommendations

There were nine major committees appointed to study the technical and engineering educations in India. Sarkar Committee was appointed in 1945 which laid the foundations for the setting up of the Indian Institute of Technology. The second which was appointed in 1959 was Thacker Committee. The aim of the Committee was to set up funding for 100 PhDs annually. The third committee was Nayudamma committee and it was appointed in 1980. The aim of the Nayudamma Committee was to uphold PG as minimum qualification for industry. The fourth committee was Nayudamma committee. It was formed in 1986. This committee recommended to create flexibility in academic programme and also gave focus on engineering research and faculty mobility.. The fifth committee was P.Rama Rao Committee and it was founded in 1995. The aim of the P.Rama Rao committee was to increase M.Tech graduate scholarships and assured employment for M.Tech and National Doctoral Programme. The sixth committee was R.A.Mashelkar Committee, which was introduced in 1998. The aim of this committee was to change the Regional Engineering College to National Institute of Technology. The seventh committee was U.R.Rao Committee. It was introduced in 2003.This committee recommended the removal of regional inequity and addressed faculty shortage problem, and also stressed the importance of planning with All India Council for Technical

Education(AICTE). The eighth committee was P.Rama Rao and it was formed in 2004. The aim of this committee was to increase the UG output and fund infrastructure and recommended the need to raise the quality of Indian Institute of Technology. The last and ninth committee was National Knowledge Commission. It was introduced in 2008. This committee recommended the establishment of Independent Regulatory Authority for higher education and recommended greater flexibility to engineering colleges. It also aimed at integrating Science and Engineering Education and Industry-Academic interaction.All the committees gave different and significant recommendations for the development of engineering education.

## 3.7 Growth of Engineering Institutions in India

The Indian Engineering institutions witnessed an outstanding growth over the year 2000. The establishment of the Indian Institutes of Technology, Indian Institutes of Management and Indian Institutes of Science were a vital decision in the development of technical education in the Indian scenario. These institutions aim to produce competent and hard core intelligent engineers and scientist that would change the outlook of India. Formal Technical Education in India started in the period of mid of 19th century. At the time of independence in 1947, the number of engineering colleges and polytechnics were 44 and 43 respectively with an annual intake capacity of 3200 and 3400 respectively. In the early 1980s, there were about one hundred engineering colleges admitting around 25,000 students each year. After 2000,there were many engineering colleges appeared. It can be depicted in table 3.9.

**Table 3.9**
**Growth of Engineering Institutions in India**

| Year | Institutions | Growth | Growth Percent |
|---|---|---|---|
| 2006-07 | 1511 | 150 | 8% |
| 2007-08 | 1668 | 157 | 10% |
| 2008-09 | 2388 | 720 | 43% |
| 2009-10 | 2972 | 584 | 24% |
| 2010-11 | 3222 | 250 | 8% |
| 2011-12 | 3393 | 171 | 5% |
| 2012-13 | 3498 | 105 | 3% |
| 2013-14 | 3887 | 389 | 11% |
| 2014-15 | 4276 | 389 | 10% |
| 2015-16 | 4561 | 412 | 12% |
| 2016-17 | 4812 | 423 | 14% |

Source: All India Council for Technical Education (AICTE), (2006-2018)

Table 3.9 represents that there is an increasing trend in engineering institutions over the years. The percentage of the growth rate is also increasing. In 2006-07 the growth rate is 10 percent and in 2013-14 it was 11 per cent. A moderate growth was clear from the year 2008-09 and after that growth percentage was decreasing. After 2013, there was an upsurge of engineering institutions in India.

**Table 3.10**
**Total Unemployed Graduate Engineers in India (Selected State-wise)**

| States | 2004 | 2008 | 2012 | 2014 | 2016 |
|---|---|---|---|---|---|
| Andhra Pradesh | 11865 | 50128 | NA | 125467 | 186423 |
| Chandigarh | 239 | 254 | 463 | 612 | 679 |
| Delhi | 440 | 1526 | 2197 | 3874 | 4961 |
| Gujarat | 7642 | 10235 | - | 32656 | 45102 |
| Haryana | 1206 | 3044 | 6078 | 6411 | 6847 |
| Himachal Pradesh | 333 | NA | 1561 | 2541 | 3217 |
| Karnataka | 12771 | 19324 | 124653 | 148946 | 167063 |
| Kerala | 2115 | 3687 | 5014 | 10045 | 13248 |
| Madhya Pradesh | 2362 | NA | 9541 | 10348 | 12347 |
| Maharashtra | 27639 | 59812 | 114118 | 124557 | 140012 |
| Punjab | 2038 | 2469 | 3047 | 4051 | 4872 |
| Tamil Nadu | 49752 | 80457 | 135474 | 154321 | 161346 |
| West Bengal | 1616 | 4273 | 6642 | 6814 | 7325 |

NA: Not Applicable, (-): Implies data not Available

Source: Institute of Applied Manpower Research (2004-2016)

Table 3.10 indicates that selected state wise unemployed Engineers (Degree) in India. It clearly specified that in 2016, Andhra Pradesh has the highest unemployed engineering graduates in India than other states. The second and third position is given to Karnataka and Tamil Nadu. Detailed state wise unemployed engineers in India were depicted in appendix II.

## 3.8 Enrollment of Engineering Graduates in India

There are number of engineering degree holders in the working age group between various branches. Every year new branches are coming up. Selected branch wise engineering graduates from India were given below table 3.11.

## Table 3.11
## Number of Engineering Degree Holders in India
## (Selected Disciplines in
## 1999 to 2015)

.

| Discipline | 1999 | 2000 | 2004 | 2006 | 2007 | 2008 | 2010 | 2012 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Civil | 178860 | 184860 | 242143 | 301892 | 321753 | 355684 | 401241 | 436517 | 473144 | 496572 |
| Mechanical | 214430 | 224210 | 264153 | 285412 | 293641 | 301246 | 321146 | 341653 | 362594 | 371540 |
| Electrical | 131970 | 138250 | 168450 | 176823 | 182340 | 190012 | 204176 | 219763 | 230694 | 237561 |
| Electronics & Telecom | 132020 | 148320 | 203465 | 241571 | 264992 | 276579 | 302145 | 351764 | 374120 | 378532 |
| Automobile | 3490 | 3720 | 4489 | 4526 | 4671 | 4702 | 4922 | 5064 | 5471 | 5563 |
| Aeronautical | 2150 | 2220 | 2487 | 2571 | 2648 | 2693 | 2806 | 2911 | 3056 | 3149 |
| Agriculture | 4680 | 4860 | 5741 | 5963 | 6214 | 6381 | 6539 | 6833 | 6987 | 7024 |
| Production | 18600 | 20500 | 28631 | 32641 | 34612 | 36487 | 40123 | 44891 | 48001 | 49560 |
| Architecture | 18150 | 19390 | 24517 | 26841 | 27463 | 28415 | 30152 | 31942 | 32567 | 32940 |
| Instrumentation | 15190 | 17040 | 23014 | 25016 | 26001 | 27148 | 29001 | 31861 | 33697 | 33810 |
| Others | 122350 | 136210 | 201356 | 241503 | 246912 | 265310 | 291057 | 310560 | 336954 | 350911 |
| **Total** | **913740** | **969540** | **1271971** | **1455723** | **1524740** | **1614076** | **1766279** | **1924532** | **2056201** | **2121514** |

Note: Stock in at the beginning of the year,

Source: Institute of Applied Manpower Research (1999-2000, 2004,2 006, 2008, 2010,2012,2014,2015)

Table 3.11 illustrates that much more engineering graduates were working age group in different discipline of various years. In 1999 the total number of engineering degree holder was 913740 and it is increased to 2121514 in 2015. There is an increasing trend in total number of engineering degree holders. Detailed selected discipline wise engineers in working age group in India were depicted in appendix III. The selected state wide student's intakes were given below:

## Table 3.12
## State-wise Students Intake in Degree Engineering in India
## (1999-2000 to 2009-2010)

| State/UTs | 1999-2000 | 2001-2002 | 2003-2004 | 2005-2006 | 2007-2008 | 2009-2010 |
|---|---|---|---|---|---|---|
| Andhra Pradesh | 25435 | 46750 | 68754 | 79681 | 88631 | 97547 |
| Delhi | 2420 | 2950 | 3871 | 4102 | 4791 | 5063 |
| Himachal Pradesh | 410 | 410 | 712 | 785 | 806 | 867 |
| Jammu & Kashmir | 1360 | 1165 | 1286 | 1863 | 2003 | 2289 |
| Karnataka | 26337 | 36625 | 42301 | 47314 | 55987 | 63214 |
| Kerala | 5385 | 10654 | 21034 | 29174 | 35410 | 46320 |
| Madhya Pradesh | 7735 | 9950 | 13452 | 13784 | 13659 | 14863 |
| Maharashtra | 35835 | 43620 | 49712 | 53742 | 58743 | 65283 |
| Orissa | 6360 | 8665 | 10234 | 11321 | 12643 | 13864 |
| Pondicherry | 580 | 1690 | 2014 | 2871 | 3586 | 4102 |
| Punjab | 4050 | 5320 | 9631 | 11425 | 13964 | 16842 |
| Tamil Nadu | 31895 | 66207 | 85314 | 102234 | 164370 | 201456 |
| Tripura | 160 | 160 | 160 | 160 | 160 | 160 |
| Uttaranchal | 0 | 2130 | 2395 | 2548 | 2717 | 3102 |
| Uttar Pradesh | 12886 | 18471 | 27841 | 37463 | 47568 | 55304 |
| West Bengal | 5077 | 8539 | 11234 | 12541 | 13587 | 15237 |
| **India** | **185758** | **295796** | **423125** | **541202** | **647238** | **778412** |

Source: Institute of Applied Manpower Research (1990-2010)

Table 3.12 evidently indicates the students' intake (the students taken into an organization at a particular time) of engineering degree programme in various states in India. The total student intake in1999 was 185758 and it was increased to 778412 in 2009-10.Andhra Pradesh was the state with highest number of engineering graduates in India. Complete state wise students intakes in engineering degree in India are attached in appendix IV.

## Table 3.13
## State –wise Approved Intakes, Enrolled Students and Percentages of Seats in Engineering Colleges in India(2012-2013 to 2014-2015)

| States/UTs | 2012-13 | | | 2013-14 | | | 2014-15 | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Approved Intake*** | **Enrolled Students** | **Seats Filled Percentage** | **Approved Intake*** | **Enrolled Students** | **Seats Filled Percentage** | **Approved Intake*** | **Enrolled Students** | **Seats Filled Percentage** |
| Andaman and Nicobar Islands | 90 | 93 | 100 | 90 | 94 | 100 | 90 | 91 | 100 |
| Andhra Pradesh | 189825 | 98682 | 52 | 186135 | 94679 | 51 | 198120 | 91690 | 46 |
| Assam | 4515 | 2728 | 60 | 5115 | 2840 | 56 | 5475 | 2529 | 46 |
| Gujarat | 61164 | 47880 | 78 | 67224 | 54123 | 81 | 75504 | 50174 | 66 |
| Haryana | 69054 | 30757 | 45 | 72068 | 27337 | 38 | 72644 | 25801 | 36 |
| Karnataka | 101608 | 76695 | 75 | 106448 | 80970 | 76 | 111062 | 85735 | 77 |
| Kerala | 59526 | 42782 | 72 | 61612 | 44091 | 72 | 66656 | 43466 | 65 |
| Madhya Pradesh | 107009 | 71709 | 67 | 115982 | 63639 | 55 | 115838 | 54175 | 47 |
| Maharashtra | 168545 | 119776 | 71 | 176693 | 117015 | 66 | 178310 | 103787 | 58 |
| Telangana | 192311 | 94779 | 49 | 198445 | 91057 | 46 | 209530 | 84050 | 40 |
| Uttar Pradesh | 158642 | 86858 | 55 | 167641 | 82519 | 49 | 166596 | 80649 | 48 |
| Uttarakhand | 15734 | 7499 | 48 | 16274 | 6235 | 38 | 14874 | 5737 | 39 |
| West Bengal | 35588 | 25294 | 71 | 37258 | 24504 | 66 | 40768 | 21253 | 52 |
| India | **1652441** | **1009584** | **61** | **1737526** | **986817** | **57** | **1807071** | **919603** | **51** |

Source: AICTE Report, (2012-2015)

The state wise approved intakes and enrollment and percentages of seats filled are given in table 3.13. It showed that there is an upward trend in student intakes. Broad state-wise student intakes in engineering degree, enrollment percentages and percentages of seats filled in engineering in India is given in appendix V. The numbers of enrolled student were changing day by day. As per All India Council of Technical Education (AICTE), the gender wise classification in students' enrollment is given table 3.14.

## Table 3.14
## Number of Enrolled Students in Technical Courses in India (2015-2016 to 2017-2018)

| Year | No. of Enrolled Girls Students | No. of Enrolled Boys Students |
|---|---|---|
| 2015-2016 | 392594 | 1285950 |
| 2016-2017 | 369830 | 1190043 |
| 2017-2018 | 356446 | 1129984 |

Source: All India Council for Technical Education Report,(2015-2018).

Table 3.14 displays the enrollment of both the genders, namely, girls and boys which is decreasing from the 2015 to 2018. In the year 2018, the girls' enrolment was 356446 and boys' enrollment was 1129984. Table 3.15 demonstrates the gender wise classification of enrollment of students' number. In recent years (2015-2018), the enrollment rates of the students revealed a declining trend.

**Table 3.15**
**Sanctioned Intake, Enrollment and Placement of Students in AICTE Approved Engineering Colleges in India (2014-15 to 2016-17)**

| Academic Year | Total Number of Students Graduating from Govt. Engineering Colleges | Students Securing Placement | Total Number of students Graduating from Private Engineering Colleges | Students Securing Placements | Sanctioned Intake | Enrolled Students | Students Placed | Average Placement (In Percentage) |
|---|---|---|---|---|---|---|---|---|
| 2014-2015 | 70072 | 28696 | 689098 | 305904 | 3961662 | 2138023 | 668965 | 42.48 |
| 2015-2016 | 80036 | 34228 | 705425 | 326877 | 3835795 | 2076395 | 697233 | 42.97 |
| 2016-2017 | 79503 | 29012 | 698089 | 333817 | 3701674 | 1932644 | 640573 | N.A. |

NA: Not Applicable

Source: Ministry of Statistics and Programme Implementation,
Govt. of India.

The table 3.15 represents the sanctioned intake of engineering students and their placement details in All India Council for Technical Education (AICTE) approved engineering colleges. As we look at the average placement, it indicated that there is a slight increase in the average placement of the engineering graduates.

## Table 3.16

## Estimated Number of Engineers* (Degree and Diploma Holders) in India ( 1961-2011 and 2011 to 2015)( ' 00)

| Year | Degree Holders | Diploma Holders | Total |
|---|---|---|---|
| 1961 | 640 | 840 | 1480 |
| 1971 | 1745 | 2304 | 4049 |
| 1981 | 3049 | 4258 | 7307 |
| 1991 | 5196 | 8593 | 13789 |
| 2001 | 10244 | 15317 | 25561 |
| 2011 | 19142 | 20674 | 39816 |
| 2012 | 20351 | 21360 | 41711 |
| 2013 | 21742 | 21753 | 43495 |
| 2014 | 22425 | 21947 | 44372 |
| 2015 | 25364 | 22416 | 47780 |
| 2016 | 28784 | 23145 | 51929 |
| 2017 | 29461 | 23673 | 53134 |

*: Refers to the stock in the working age group.
Source: Department of Education, Ministry of Human Resource Development,(1961-2017)

Table 3.16 portrays that there is considerable growth in the degree and diploma engineering holders in India. There is an increasing trend in the engineering graduates over the years. In 1961, engineering degree holders were only 640 and it was increasing till the year 2015. In the year 2015 the number of engineering graduates was 25,364 and it got increased in 2017. It indicated that engineering education had a more preferred position in India as a profession.

## 3.9 Employability in India

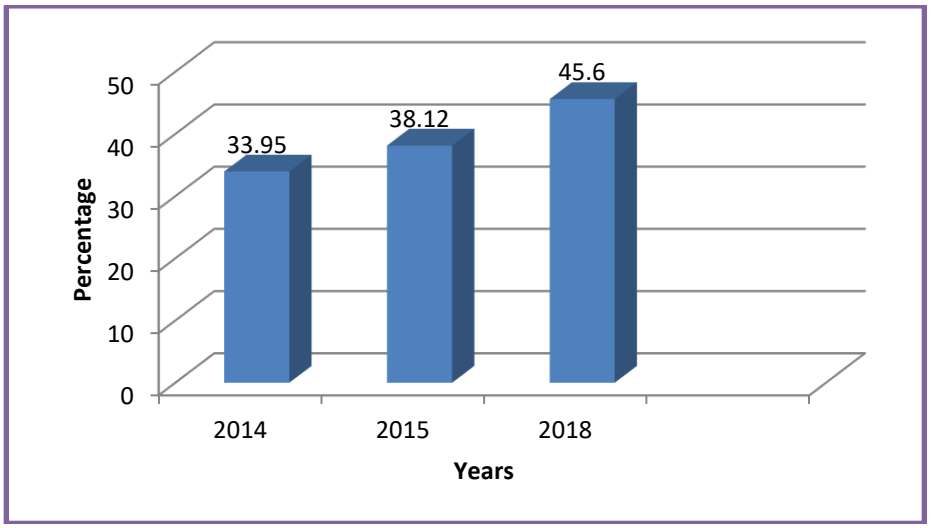
Employability has been enumerated based on the standard studies done by various companies in different sectors by Aspiring Minds. Currently, Aspiring Minds' Computer Adaptive Test (AMCAT) is used by more than 3500 companies; including seven of the top ten IT services companies in India, for their assessment and recruitment solutions. The benchmark for employability in a profile and sector is defined by a theoretical

understanding and empirical validation of the knowledge, cognitive skills and domain expertise required.

The growing importance on employability skills of potential engineers has effected a momentous upsurge in the unemployment among engineering graduates. As a consequence the institutions of higher learning around the world are very much concerned about their graduate employment. Most of the engineering students have given priority to their employability upon graduation. The new and fresh engineering graduates confront with more challenges and competitions in getting employment compared to previous graduates. The excellent academic degrees alone are inadequate as employers require potential engineers for competencies and capabilities in generic skill since globalization demands the companies to be more competitive in their management system (Mohammad 2004).

The percentage of employable Indian engineering graduates is diminishing at an alarming rate every year. This requires immediate and urgent attention of every one. This issue should be addressed immediately and effectively to confirm that India can maintain its competitive advantage in terms of qualified graduates. After the economic liberalization from 1991, slight attention was paid to the education field in terms of introducing reforms to the highly regulated education system in the country. As McKinsey report pointed out, the Indian factories would need more than 73 million workers by 2015 and it would be 50 per cent more than what is existing today. Only twenty five per cent of the total B.Tech graduates in the country are employable. This observation was made on the basis of the technical skills, communicative skills, team work and presentation skills. Out of the 4 lakh engineers who pass out from various engineering colleges across the country, only one lakh of them are fit in terms of working with a company. In the case of other graduates the situation is worse. Only 15 per cent of the total graduates in the country are employable (NASSCOM Report,2015-16).

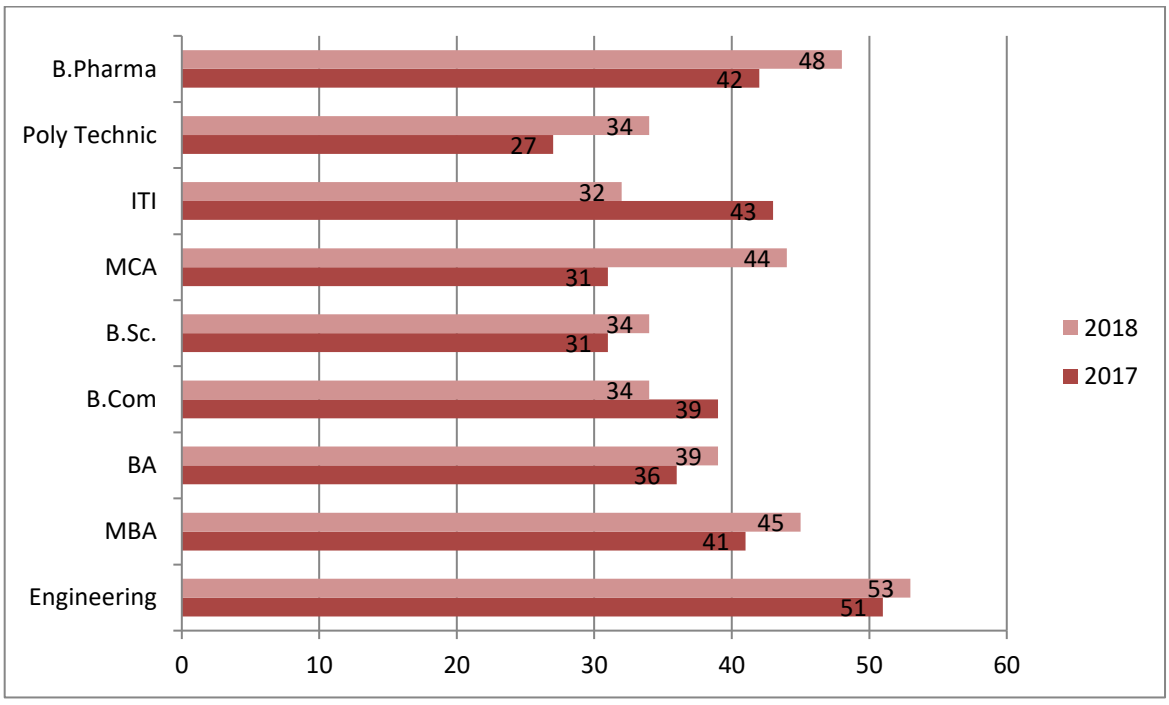
**Figure 3.3**
**Growth of Employability (%)**




Source : All India Council for Technical Education (2014-,2015,2018)

Figure 3.3 represents the employability and growth of engineering graduates in 2014, 2015 and 2018. Figure 3.3 indicates the percentage growth of the employability of graduates in India. Over the years, the growth rate of engineering graduates had been increasing. The domain wise employability level is given in figure 3.4.

**Figure 3.4**
**Domain wise Employability**

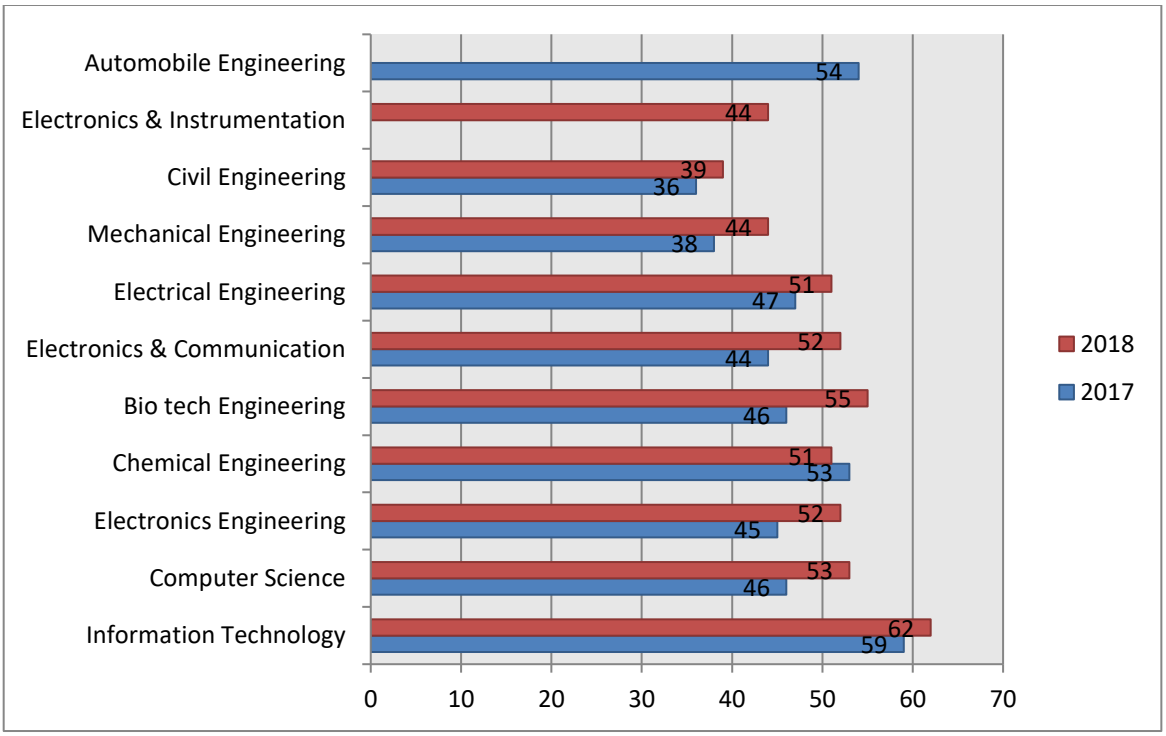



Source: India Skills Report (WHEEBOX Report), 2018

The survey report explained that across various courses, overall employability in India had risen to 45.6 per cent in 2018. Students graduating from Industrial Training Institutes ($ITI_s$) or Polytechnic colleges were least employable. The branch wise or course wise employability were given figure 3.5.

**Figure 3.5**

**Employability of Engineering Graduates (Discipline Wise)**




Source: WHEEBOX Report, 2018.

Figure 3.5 explains that among the various branches, Computer Science is the most employable course. Those courses which are without a software stream, such as, chemical engineering and mechanical engineering have become slightly less attractive to employers in 2018.

Engineering degree holders are absorbed in different sectors of the industry. Within the IT sector there are various sectors which offer employment like IT Product, IT Services and Associate Information Technology enabled Services (ITeS) Operations. With a variety of startups coming up, and that the students showing an inclination towards joining them, the employability of engineering graduates is likely to be increased. Engineering roles include roles such as Technical Content Developer, Analyst and Sales

Engineers. Given that IT jobs are not growing at the same pace as before, engineers are pursuing different kinds of roles that draw on their analytical and technical skills. The employment of engineers in these roles will only grow with time and it is important to capture the trends of employability in them (Employability Report, 2016).

## Table 3.17

## Employability of Engineering Graduates in Different Roles

| Role | Employability | |
|---|---|---|
| | 2014 | 2016 |
| **IT Roles** | | |
| Software Engineers -IT product | 3.21 | 3.67 |
| Software Engineers -IT services | 18.43 | 17.91 |
| Associate-ITES operations(Hardware & Networking) | 35.37 | 37.06 |
| Start up Ready-IT services | ---------- | 3.84 |
| **Engineering Roles** | | |
| Design Engineers -Non IT | 7.49 | 6.56 |
| Sales Engineers -Non IT | 16.54 | 19.08 |
| **Non-Tech Roles** | | |
| Business Analyst-KPO | 11.53 | 10.86 |
| Associate-ITeS/BPO | 39.84 | 40.57 |
| Creative content Developer | 15.36 | 11.66 |
| Technical content Developer | 10.81 | 16.72 |

Source: National Employability Report 2014 and 2017(Figures are in percentages)

As per Employability Report (2014 and 2016), for most roles, there is a slight change in the employability compared to the previous year. This is as per expectation since it would not vary largely in a single year. To summarize, it is evident from these grim employability figures that there exists a deep gap between the actual skills of engineers and the skills expected from them on the job.

## Table 3.18

## Employability Vs Employment Outcomes

| Year | Engineers | | | | |
|---|---|---|---|---|---|
| | Employable | Got an interview opportunities | Reached final round | Employed | Average Salary(in INR lakhs) |
| 2014 | 18.33 | 75.14 | 41.09 | 18.09 | 2.82 |
| 2016 | 19.11 | 72.64 | 51.66 | 19.91 | 3.13 |

Source: National Employability Report 2014 and 2016.(Figures are in percentages)

It is evident from table 3.18 that 19.91 per cent engineers got employed despite of the fact that only 19.11 per cent engineers were employable. About 27 per cent of the engineers did not even get an opportunity for interview and this figure increased when the percentage of engineers who could make it to the final round were concerned (Aspiring Mind's Report, 2016).

## Table 3.19

## Employability of Engineering Graduates in India (Gender Wise)

| Year | Gender | Employable | Got an interview opportunities | Reached final round | Employed | Average Salary(in INR lakhs) |
|---|---|---|---|---|---|---|
| 2014 | Male | 18.86 | 73.49 | 40.59 | 17.27 | 2.86 |
| | Female | 17.34 | 78.25 | 42.05 | 19.64 | 2.75 |
| 2016 | Male | 18.74 | 71.02 | 51.17 | 20.00 | 3.18 |
| | Female | 19.97 | 76.40 | 51.17 | 19.69 | 3.03 |

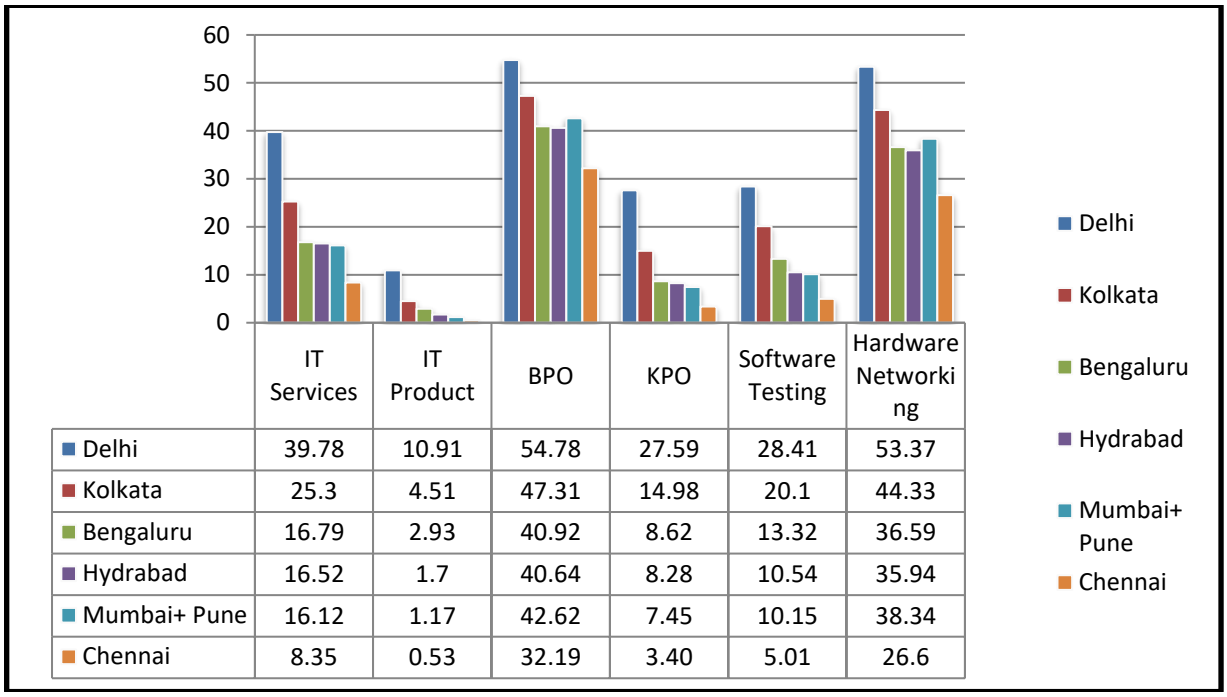
Source: National Employability Report 2014 and 2016.

Male and female are equally employable and have similar employed percentages though the hiring practices seem to be skewed in favour of female as the percentage of female engineers getting an opportunity for interview and this figure reaching the final round is more than that for male candidates. The reasons for

employability of men being slightly better than women might be attributed to their performance on cognitive skills. The average salary figures for men are slightly better than those calculated for women. This trend is in line with previous year's analysis.

**Figure 3.6**

**Employability across Metro Cities**




| | IT Services | IT Product | BPO | KPO | Software Testing | Hardware Networking |
|---|---|---|---|---|---|---|
| Delhi | 39.78 | 10.91 | 54.78 | 27.59 | 28.41 | 53.37 |
| Kolkata | 25.3 | 4.51 | 47.31 | 14.98 | 20.1 | 44.33 |
| Bengaluru | 16.79 | 2.93 | 40.92 | 8.62 | 13.32 | 36.59 |
| Hydrabad | 16.52 | 1.7 | 40.64 | 8.28 | 10.54 | 35.94 |
| Mumbai+ Pune | 16.12 | 1.17 | 42.62 | 7.45 | 10.15 | 38.34 |
| Chennai | 8.35 | 0.53 | 32.19 | 3.40 | 5.01 | 26.6 |

Source: National Employability Report, 2017

Figure 3.6 clearly indicates the employability across metro cities in India. This figure showed that Delhi is one of the most attractive cities for IT services and Business Process Outsourcing (BPO). The city of Chennai is the least attractive metro city as far as the IT and Business Process Outsourcing (BPO) are concerned.

## 3.10 Employment and Unemployment in Kerala

Kerala is the southernmost state consistently top in literacy levels and human development indices and paradoxically has one of the highest unemployment rates in the country. As per Annual Employment -Unemployment Survey 2015-16 conducted by Ministry of Labour and Employment found out that Kerala's unemployment rate is 12.5 per cent against the all India level of 5 per cent, making it the third highest in the country after Sikkim and Tripura.

The main data source on employment and unemployment situation in the states as well as the country is the quinquennial household surveys conducted by National Sample Survey Office (hereafter NSSO). As per the survey report, the Unemployment Rate (hereafter UR) among the youth in Kerala is high in Kerala. This brings to the forefront the depth of unemployment in Kerala. The UR of the youth is 21.7 per cent for rural areas and 18.0 per cent for urban areas. Similarly, the UR among the female youth is also much higher than that of the male youth. Area wise UR data shows that 47.4 per cent of women are in rural areas as against the men consisting of 9.7 per cent (NSSO, 68th Round). Table 3.20 depicts the literacy rate of Kerala according to the Census Report of 2011 as reported by the Economic Review (2013).

## Table 3.20

## Literacy Rate of Kerala

| Year | Persons | Male | Female |
|---|---|---|---|
| 1951 | 47.18 | 58.35 | 36.43 |
| 1961 | 55.08 | 64.89 | 45.56 |
| 1971 | 69.75 | 77.13 | 62.23 |
| 1981 | 78.85 | 84.56 | 73.36 |
| 1991 | 89.81 | 93.62 | 86.17 |
| 2001 | 90.86 | 94.24 | 87.72 |
| 2011 | 93.91 | 96.02 | 91.98 |

Source: Economic Review 2013

The years from 1951-2011 clearly indicated that literacy level of Kerala is increasing. The gender wise literacy level also showed increase.

The work participation rate is an important variable to consider while analyzing unemployment data because it reflects the number of people who are interested in participating in the workforce. Workforce participation rate, a useful measure of economic activity is computed as the ratio of total workers to the total population, expressed as a percentage. The work participation rate of Kerala in various census years is given table 3.21.

## Table 3.21

## Work Participation Rate in Kerala

| Year | Total | Male | Female |
|---|---|---|---|
| 1981 | 30.5 | 44.9 | 16.6 |
| 1991 | 31.4 | 47.6 | 15.9 |
| 2001 | 32.30 | 50.40 | 15.38 |
| 2011 | 34.78 | 52.73 | 18.23 |

Source: Census of India

Table 3.21 gives the idea that the total male and female work participation rate of various census years are increasing. According to the latest census year (2011) the total rate of work participation was 34.78 per cent.

## Table 3.22

## Work Participation Rate in Kerala –District Wise

| SL.No | Districts | Male | | Female | |
|---|---|---|---|---|---|
| | | 2001 | 2011 | 2001 | 2011 |
| 1 | Kasargod | 49.1 | 51.7 | 21 | 20.3 |
| 2 | Kannur | 49.9 | 51.6 | 15.3 | 16 |
| 3 | Wayanad | 55.8 | 56.9 | 23.2 | 26.8 |
| 4 | Kozhikode | 48.7 | 51.1 | 8.2 | 12.2 |
| 5 | Malappuram | 42.8 | 45.8 | 6.6 | 7.6 |
| 6 | Palakkad | 52 | 54.9 | 21.2 | 20.4 |
| 7 | Thrissur | 50.6 | 53.3 | 15.2 | 18.7 |
| 8 | Ernakulam | 55.1 | 56.4 | 17.2 | 20.2 |
| 9 | Idukki | 58.1 | 60 | 28.1 | 33.2 |
| 10 | Kottayam | 52.2 | 54.8 | 14 | 20.4 |
| 11 | Alappuzha | 49.4 | 53 | 20.3 | 24 |
| 12 | Pathanamthitta | 47.5 | 50.2 | 13.4 | 17.5 |
| 13 | Kollam | 48.4 | 51.7 | 16.8 | 19.3 |
| 14 | Thiruvanthapuram | 52.7 | 54.6 | 14.5 | 21.4 |

Source: Census Report (2001and 2011)

The district wise work participation rate in Kerala was increasing as per census report of 2011. In Kerala, the highest male and female work participation rate is in Idukki district i.e. 60 per cent and 33.2 per cent respectively. The lowest work participation rate is recorded in the district of Malappuram both for men and women.

## Table 3.23

## Labour Force Participation Rate in Kerala

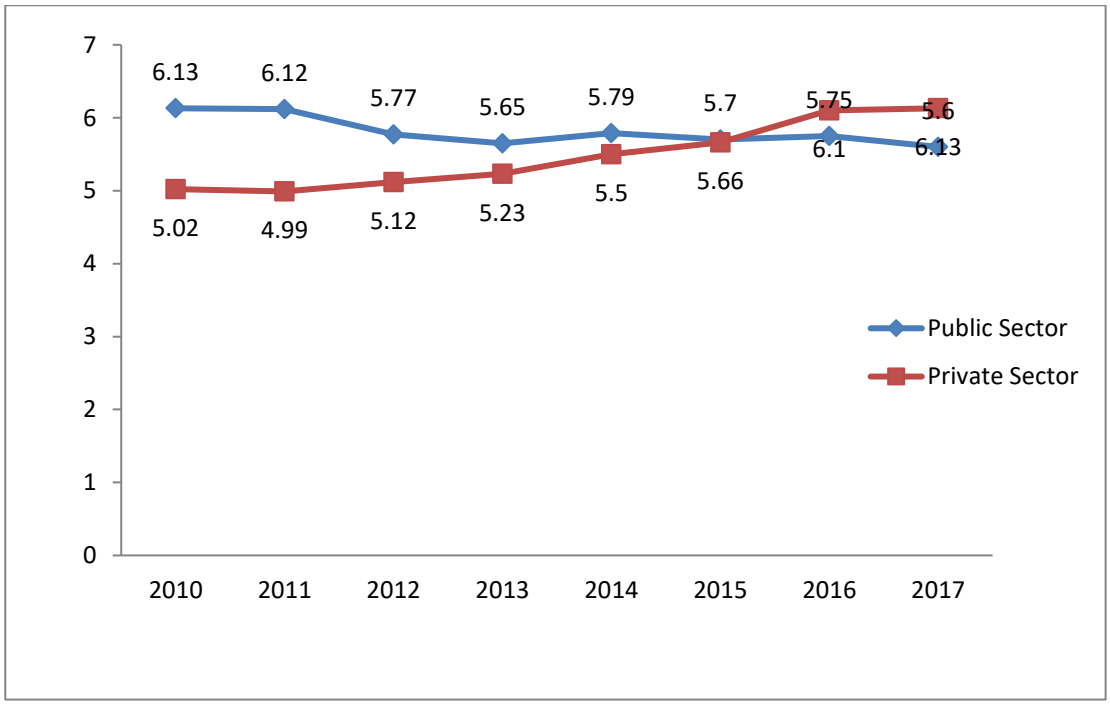
| Year | Rural | | Urban | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 1987-1988 | 55.8 | 33.6 | 59 | 26.1 |
| 1993-1994 | 56.8 | 26.4 | 59.9 | 25 |
| 1999-2000 | 58.7 | 27.3 | 59.1 | 25.4 |
| 2004-2005 | 58.9 | 32.1 | 58.3 | 30.1 |
| 2009-2010 | 58.3 | 26 | 56.4 | 23.3 |
| 2011-2012 | 58.3 | 25.8 | 56.7 | 22.2 |

Source: Various Rounds of NSSO(43rd,50th,55th,61th,66th and 68th Round)

Table 3.23 explains that male labour force participation rate is more than women participation rate. The various NSSO rounds clearly shows the Kerala's labour force participation rate. In 2011and 2012 the rural male labour force participation was stagnant at the same time urban male participation was increasing. The female labour force participation was showing a declining trend. NSSO Rounds of 43rd to 68th clearly bring out the labour participation rate of Kerala.

## Figure 3.7

## Employment in the Organized Sector in Kerala




Source: Economic Review, 2017.

Employment in the organized sector in Kerala has remained more or less stagnant, showing only a marginal increase from 11.15 lakh in 2010 to 11.73 lakh in 2017. The main reason behind this trend could be due to the movement of labour force to the informal sectors like construction, real estate, textiles and communication, which provides more employment opportunities. The organized sector contains private and public sectors and it is remarkable that private sector employment was steadily growing since 2011. In 2017, out of 11.73 lakh persons employed in the organized sector, 5.60 lakh (48 per cent) were in the public sector and 6.13 lakh (52 per cent) were in the private sector.

Out of the total job seekers, 60 per cent were women. Number of the illiterate persons in the live register was 1291. Distribution of job seekers by education in the table indicated that only 10 per cent had qualification below SSLC. About 62 per cent of the job seekers were having qualifications above SSLC (Economic Review, 2017).

## Table 3.24

## Number of Job Seekers in Kerala (in lakhs)

| Year | Below SSLC | | SSLC & ABOVE | | Total Work Seekers |
|---|---|---|---|---|---|
| | Persons | Percentage to Total | Persons | Percentage to Total | |
| 2001 | 9.67 | 21.8 | 34.64 | 78.2 | 44.31 |
| 2002 | 7.12 | 19.3 | 29.68 | 80.7 | 36.80 |
| 2003 | 7.46 | 18.6 | 32.58 | 81.4 | 40.5 |
| 2004 | 6.73 | 17.9 | 30.83 | 82.1 | 37.56 |
| 2005 | 6.29 | 17.1 | 30.41 | 82.9 | 36.70 |
| 2006 | 6.37 | 16.5 | 32.19 | 83.5 | 38.57 |
| 2007 | 6.31 | 15.8 | 33.58 | 84.2 | 39.89 |
| 2008 | 6.24 | 15.1 | 34.96 | 84.9 | 41.2 |
| 2009 | 6.37 | 14.63 | 37.19 | 85.3 | 43.56 |
| 2010 | 5.96 | 13.76 | 37.35 | 86.24 | 43.31 |
| 2011 | 5.88 | 13.48 | 37.64 | 86.29 | 43.62 |
| 2012 | 5.98 | 13.29 | 39.01 | 86.71 | 44.99 |
| 2013 | 4.26 | 11.66 | 32.25 | 88.33 | 36.51 |
| 2014 | 3.81 | 10.10 | 33.91 | 89.8 | 37.72 |
| 2015 | 4.05 | 11.07 | 32.52 | 88.92 | 36.57 |

Source: Directorate of Employment, 2015.

According to live register of employment exchanges in Kerala, the total number of job seekers as on December 2012 was 44.99 lakh. But it had declined to 36.83 lakh as on October 2017, a reduction of about 8.16 lakh (Economic Review 2017). Details of job seekers for various years are given in table 3.25.

## Table 3.25

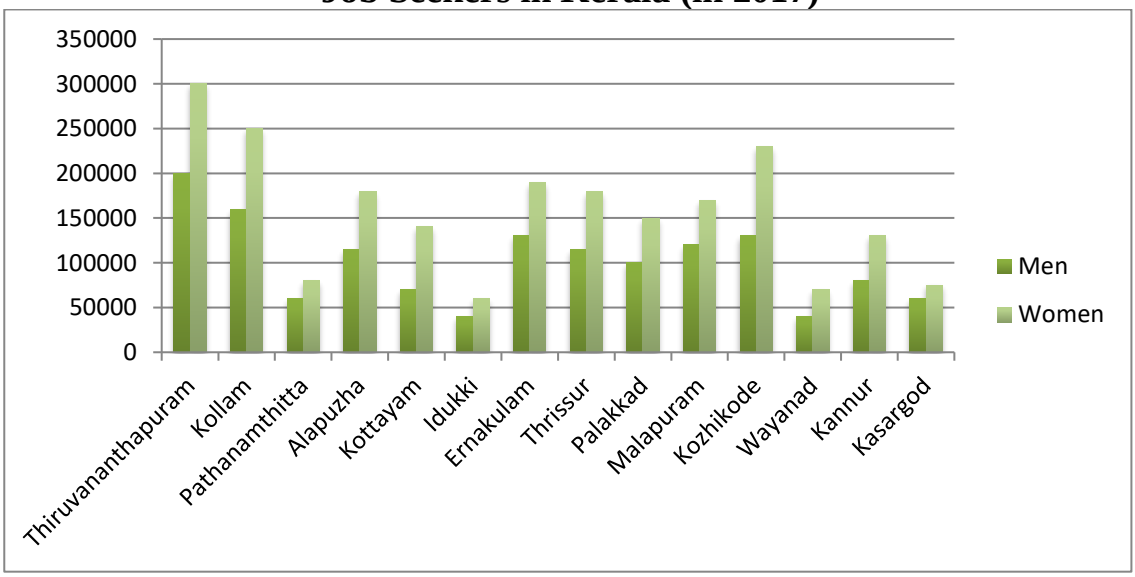
## Kerala Job Seekers (in Lakhs)

| Year | General Job Seekers | Professional/Technical Job Seekers | Total Job Seekers |
|---|---|---|---|
| 2005 | 34.93 | 1.77 | 36.70 |
| 2006 | 36.93 | 1.64 | 38.57 |
| 2007 | 38.39 | 1.49 | 34.88 |
| 2008 | 40.01 | 1.43 | 41.44 |
| 2009 | 41.54 | 1.46 | 43.00 |
| 2010 | 41.60 | 1.50 | 43.10 |
| 2011 | 41.98 | 1.64 | 43.62 |
| 2012 | 43.29 | 1.70 | 44.99 |
| 2013 | 34.83 | 1.68 | 36.51 |
| 2014 | 36.21 | 1.51 | 37.72 |
| 2015 | 34.09 | 1.63 | 35.72 |
| 2016 | 32.67 | 1.7 | 34.37 |

Source: Economic Review 2016, Government of Kerala.

Table 3.25 elucidates the number of general work seekers, professional work seekers and total work seekers in 2005-2016. Compared to professional workers, the general work seekers were higher. The district of Thiruvananthapuram (5.2 lakh) ranks first in the number of work seekers in general and professional workers. The district of Kollam has the second largest number of work seekers with 3.85 lakh and the lowest number of work seekers (.863 lakh) was in the district of Wayanad (Economic Review, 2016).

## Figure 3.8
## Job Seekers in Kerala (in 2017)




Source: Economic Review, 2016

The magnitude of unemployment in Kerala is very high because of the high literacy rate. Kerala's employment and unemployment indicators are given in table 3.26.

## Table 3.26

## Employment and Unemployment Indicators in Kerala

| Indicator | Urban | | | Rural | | | Total (rural+urban) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Male+Female | Male | Female | Male+ Female | Male | Female | Male+Female |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| NSS 68th Round(2011-2012) | | | | | | | | | |
| Usual Principal Status | | | | | | | | | |
| LFPR | 565 | 208 | 375 | 558 | 199 | 370 | 563 | 205 | 373 |
| WPR | 543 | 161 | 379 | 540 | 161 | 341 | 542 | 161 | 340 |
| PU | 22 | 47 | 35 | 18 | 38 | 29 | 21 | 45 | 34 |
| UR | 39 | 227 | 94 | 33 | 192 | 78 | 37 | 218 | 90 |
| Usual Principal & Subsidiary status | | | | | | | | | |
| LFPR | 583 | 258 | 410 | 567 | 222 | 386 | 579 | 248 | 403 |
| WPR | 565 | 221 | 382 | 552 | 191 | 363 | 562 | 213 | 377 |
| PU | 18 | 36 | 28 | 15 | 31 | 23 | 17 | 35 | 27 |
| UR | 31 | 142 | 68 | 27 | 139 | 61 | 30 | 141 | 66 |
| Current Weekly Status | | | | | | | | | |
| LFPR | 561 | 226 | 382 | 551 | 204 | 369 | 558 | 220 | 379 |
| WPR | 527 | 180 | 342 | 525 | 168 | 338 | 526 | 177 | 341 |
| PU | 34 | 47 | 41 | 26 | 37 | 32 | 32 | 44 | 38 |
| UR | 61 | 206 | 107 | 47 | 179 | 85 | 57 | 199 | 101 |
| Current Daily Status | | | | | | | | | |
| LFPR | 527 | 200 | 353 | 528 | 190 | 351 | 527 | 198 | 352 |
| WPR | 462 | 145 | 293 | 482 | 150 | 308 | 468 | 146 | 297 |
| PU | 64 | 55 | 60 | 46 | 41 | 43 | 59 | 51 | 55 |
| UR | 122 | 277 | 169 | 87 | 213 | 123 | 112 | 260 | 156 |

Source: Key indicators of Employment and unemployment in India2009-2010,2011-2012.

Note:- LFPR- Labour Force Participation Rate.

WPR-Work Participation Rate

UR- Unemployment Rate.

Unemployment rate is defined as a proportion of the number of the unemployed to the total labour force (15−60), and is measured in terms of usual status, weekly status and daily status. While usual activity status implies regular unemployment, both weekly and daily status represent seasonal/temporary unemployment. The male and female unemployment rate of Kerala in rural areas were slightly decreasing under various NSSO rounds, at the same time female unemployment, particularly in rural areas, is a matter of concern in Kerala (Economic review 2017 ). This is depicted in table 3.27.

**Table 3.27**

**Unemployment Rate in Kerala**

| Year | Rural | | Urban | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 1987-1988 | 5.2 | 6.00 | 6.0 | 6.3 |
| 1993-1994 | 5.5 | 6.6 | 6.6 | 18.7 |
| 1999-2000 | 5.7 | 5.6 | 5.6 | 20.0 |
| 2004-2005 | 5.1 | 6.2 | 6.2 | 33.4 |
| 2009-2010 | 3.2 | 2.9 | 2.9 | 16.8 |
| 2011-2012 | 3.1 | 14.2 | 2.7 | 13.9 |

Source: Various NSSO Reports

As per NSSO rounds there are fluctuations in the rate of unemployment both in the rural and urban areas. It is one of the serious concerns. Table 3.28 shows that rural male unemployment rate is decreasing, and the rural female unemployment rate was fluctuating over the years. In 2011-12 unemployment rate of rural female was high compared to 2009-10. Regarding urban unemployment rate, male unemployment rate was decreasing and female unemployment was fluctuating over the years from 1987 to 2012 showing an increase.

## 3.11 Engineering Education in Kerala

At the time of independence, the state of Kerala had only one institution imparting engineering education. College of Engineering Thiruvananthapuram was the first engineering college in Kerala and it is established in the year 1939. The first Polytechnic Institute of the state was started in the year 1946-47 in Calicut. In late 1950s only one Government engineering college and two private engineering colleges were established. By 1990, the number of Polytechnics Institute in the state was 32 and there was a further spurt in the number of institutions after 2001, when self-financing

institutions were given sanction to impart engineering education particularly at graduate level.

### 3.11.1 History of Engineering Education in Kerala

Kerala has taken special care to progress an education system that is inclusive and universally accessible. Effective literacy skills pave the way for an efficient education system and employment opportunities. The spread of literacy has played a significant role in the social and economic development of the State. Kerala ranks first in the country with literacy rate of 93.91 per cent (Economic review, 2018). Christian missionaries made important contributions to the progress of education in Kerala.

#### 3.11.1.1 Engineering Education in Pre-independence Period

Technical education is reasonably a newcomer in the field of education system. The new system was born by marrying academic education with skill training, to meet the occupational needs of an industrial age. The industrial revolution which took place in the eighteenth century introduced a new method of machine-based production. College of Engineering Trivandrum, is the first engineering college in Kerala, which came into existence in 1939, popularly known as CET. It was founded during the reign of the Travancore King Chithira Thirunal BalaramaVarma. Educational development is seen to have been dealt with as the result of exogenous variables or chance factors such as benevolence of enlightened rulers, philanthropy of missionaries and far sightedness of social reformers etc. (Aiya, 1906).

#### 3.11.1.2 Engineering Education During Post-Independence Period

Prior to independence, the state had one engineering college. After attaining independence in 1947, government and the planners instantly understood the importance of developing engineering education in the country to ultimately build its industry, roads, dams, communication system, power and drinking water facilities and other infrastructure in general. This is the foundation for improvement of overall quality of life of people and to raise the living standard of nation. The engineers are the backbone and form the core of a nation to enable it to become a leading country in the world. The graduate level education leading to the award of B. E. degrees was imparted in the fields of Civil, Electrical and Mechanical Engineering. The first three years until 1950 were the years of planning and thereafter, the country entered into an era of establishment of national, state

or regional, and divisional level engineering institutions mainly for graduate courses. Gradually over a decade, transformation for postgraduate engineering education set in.

The first polytechnic of the state was started in the year 1946-47 at Calicut. Till 1955, there were not many additions to the technical institutions in the state. During the late 1950s a Government engineering college and two private engineering colleges were established. Technical education at the diploma level received much recognition during the period from 1955 to 1965 when 13 more polytechnics started functioning in the state. The number of institutions remained almost stagnant till 1980. By 1990, the number of polytechnics in the state was 32 and there was a further spurt in the number of institutions after 2001, when self -financing institutions were sanctioned to impart engineering education particularly at graduate level. The other institutions imparting engineering education are one College of Fine Arts and six University departments at degree and P.G. level.

The number of institutions in the state for the period 1947 to 2014 reveals an uneven growth of the engineering colleges in Kerala. For the period from 1947 to 2001 the diploma institutions outnumbered the degree institutions and thereafter there was a sudden rise in the growth of engineering colleges for graduation, engineering degree colleges leading to an unbalanced growth. In the year 2014 there were 163 engineering colleges, which were around three times of the diploma institutions. The average growth of the graduate institution was around two times that of the diploma institutions during this period. The unchecked growth of these institutions led to a massive outturn of engineers in numbers with undesirable consequences in the engineering labour market.

### 3.11.1.3 Milestones in Engineering Education of Kerala

The state of Kerala considering, its population has more engineering colleges. A large number of students are opting for professional courses under societal pressure. It is a significant stag in the development of engineering education in Kerala.

## Table 3.28

## Milestones in Kerala Engineering Education

| Year | Milestone |
|---|---|
| 1939 | College of Engineering Trivandrum was established |
| 1958 | TKM College of Engineering was established as the First Govt. aided institution |
| 1961 | Regional Engineering College Calicut was established as the first Central Govt. supported institution in the State |
| 1989 | Model Engineering College was established as the First Engineering College managed by a Government owned agency (IHRDE) |
| 1993 | College of Engineering Chenganur and LBS College of Engineering Kasargod was established as the First Self-Financing institutions in the State |
| 1994 | MES College of Engineering was established at Valanchery as the first Private Self-Financing Engineering College |

Source: Abdul Kalam Technological University (KTU University, Govt. of Kerala)1939-1994

Till 1955, there had not been additions to the technical institutions in the state. During late 1950s one Government engineering college and two private engineering colleges were established. As per the report of the Economic Review 2018, there are 183 engineering colleges in the State with a sanctioned intake of 57,100. Out of these engineering colleges, 171 (93.33 per cent) are self-financing colleges (unaided), 9 (5 per cent) are government colleges and 3 (1.67 per cent) are private aided colleges. Largest number of the unaided engineering colleges are functioning in Ernakulum (32) followed by Thiruvananthapuram (25). There is no government engineering college in the district of Kollam, Pathanamthitta, Alappuzha, Ernakulam, Malappuram and Kasargod. The share of engineering enrolment to total higher education enrolment in Kerala had increased during this period. This led to the liberalization of technical education which increased the number of engineering colleges in the State. The number of engineering institutions since 1950 in the state is given in table 3.29.

## Table 3.29

## Growth of Engineering Colleges in Kerala

| Year | No.of Engineering Colleges |
|---|---|
| 1950 | 1 |
| 1960 | 4 |
| 1970 | 6 |
| 1980 | 6 |
| 1990 | 9 |
| 2000 | 36 |
| 2010 | 140 |
| 2015 | 164 |
| 2017 | 180 |

Source: NTMIS Bulletin and Economic Review (2010-15)

As per Economic review 2017 there were 180 engineering colleges in the State with a sanctioned intake of 57,544 in 2017. Out of these engineering colleges, 168 (93.33 per cent) were self-financing colleges (unaided), 9 (5 per cent) were government colleges and 3 (1.67 per cent) were private aided colleges. Largest number of the unaided engineering colleges are functioning in Ernakulum (33) followed by Thiruvananthapuram (28). There is no government engineering college in districts of Kollam, Pathanamthitta, Alappuzha, Ernakulam, Malappuram and Kasargod. The district wise and management wise details of engineering colleges and sanctioned intake are given in table 3.30.

## Table 3.30

## District wise and Management wise Details of Engineering Colleges in Kerala

| SL. No | Name of District | Number of Colleges | | | | Sanctioned Intake | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Govt. | Aided | Unaided | Total | Govt | Aided | Unaided | Total |
| 1 | Thiruvananthapuram | 2 | 0 | 26 | 28 | 940 | 0 | 7680 | 8620 |
| 2 | Kollam | 0 | 1 | 17 | 18 | 0 | 740 | 4460 | 5200 |
| 3 | Pathanamthitta | 0 | 0 | 8 | 8 | 0 | 0 | 2460 | 2460 |
| 4 | Alappuzha | 0 | 0 | 11 | 11 | 0 | 0 | 3510 | 3510 |
| 5 | Kottayam | 1 | 0 | 10 | 11 | 340 | 0 | 3985 | 4325 |
| 6 | Idukki | 1 | 0 | 5 | 6 | 300 | 0 | 1360 | 1660 |
| 7 | Ernakulum | 0 | 1 | 32 | 33 | 0 | 540 | 11535 | 12075 |
| 8 | Thrissur | 1 | 0 | 20 | 21 | 530 | 0 | 6860 | 7390 |
| 9 | Palakkad | 1 | 1 | 9 | 11 | 300 | 570 | 2520 | 3390 |
| 10 | Malappuram | 0 | 0 | 12 | 12 | 0 | 0 | 2930 | 2930 |
| 11 | Kozhikode | 1 | 0 | 8 | 9 | 300 | 0 | 1920 | 2220 |
| 12 | Wayanad | 1 | 0 | 1 | 2 | 300 | 0 | 20 | 320 |
| 13 | Kannur | 1 | 0 | 6 | 7 | 330 | 0 | 2004 | 2334 |
| 14 | Kasargod | 0 | 0 | 3 | 3 | 0 | 0 | 1110 | 1110 |

Source: Economic Review 2017.

The sanctioned intake of Govt. colleges during 2017 was 3,340 (5.48 per cent), aided colleges 1,850 (3.22 per cent) and unaided colleges 52,354 (90.98 per cent). Table 3.28 shows that sanctioned intakes was high in Ernakulam district and the lowest sanctioned intake was in the district of Wayanad .

The largest number of branch wise seats was in Electronics and Communication (12063) followed by Mechanical Engineering (11165), Civil Engineering (10412) and Computer Science Engineering (10269). Branch-wise distribution of seats in engineering colleges in 1991, 2007, 2016 are given in table 3.31.

## Table 3.31

## Changes in Branch-wise Intake (1991, 2007, and 2016)

| Branch | 1991(in numbers) | Share (%) | 2007(in numbers) | Share (%) | 2016(in numbers) | Share (%) |
|---|---|---|---|---|---|---|
| Agriculture Engineering | 0 | 0 | 39 | 0.14 | 49 | 0.08 |
| Applied electronics& Instrumentation | 45 | 1.61 | 1078 | 3.95 | 960 | 1.65 |
| Architecture | 75 | 2.68 | 157 | 0.58 | 1240 | 2.13 |
| Biomedical | 42 | 1.50 | 145 | 0.53 | 240 | 0.41 |
| Chemical | 78 | 2.79 | 215 | 0.79 | 350 | 0.60 |
| Civil | 584 | 20.89 | 2050 | 7.51 | 10412 | 17.8 |
| Computer science & engineering | 255 | 9.12 | 5603 | 20.52 | 10269 | 17.6 |
| Electrical& Electronics | 580 | 20.75 | 4031 | 14.76 | 8839 | 15.19 |
| Electronics& communication | 375 | 13.42 | 6697 | 24.53 | 12063 | 20.7 |
| Electronics& instrumentations | 0 | 0 | 377 | 1.38 | 360 | 0.62 |
| Industrial | 21 | 0.75 | 17 | 0.06 | 60 | 0.10 |
| Information Technology | 0 | 0 | 2674 | 9.79 | 1779 | 3.05 |
| Instrumentation& control | 32 | 1.14 | 120 | 0.44 | 120 | 0.21 |
| Mechanical | 581 | 20.79 | 3842 | 14.07 | 11165 | 19.19 |
| Naval architecture& Ship building | 28 | 1.0 | 35 | 0.13 | 60 | 0.10 |
| Polymer engineering | 0 | 0 | 26 | 0.10 | 60 | 0.10 |
| Polymer science & rubber technology | 18 | 0.64 | 22 | 0.08 | 0 | 0 |
| Production engineering | 81 | 2.90 | 142 | 0.52 | 90 | 0.15 |
| Safety & fire engineering | 0 | 0 | 32 | 0.12 | 60 | 0.10 |
| Total | 2795 | 100 | 27302 | 100 | 58176 | 100 |

Source: NTMIS Nodal center for Kerala (Various issues) and Economic Review 2016.

Table 3.31 elucidates the branch wise intakes and its shares during the years 1991, 2007 and 2016. In 1991, the branch Civil had the highest branch wise intake among other branches. In 2007, the scene changed and Electronics and Communication had the highest branch wise intake. The data of 2016 depicted that Electronics and Communication was the leading branch wise intakes.

According to Economic Review 2016, the placement through Employment Exchanges in Kerala had been decreasing since 2010. Total placement had declined from

12,643 in 2010 to 10,303 in 2015 and further to 7,875 as on September 30th, 2016. Reduction in placement may be due to temporary posts either being filled up on daily wage or contract basis or being kept vacant. The Registered engineering graduates at employment exchanges are displayed in table 3.32.

**Table 3.32**

**Registration in Employment Exchanges (Engineering Graduates)**

| Year | Registered engineering Graduates |
|---|---|
| 2003 | 8775 |
| 2004 | 8265 |
| 2005 | 9395 |
| 2006 | 8466 |
| 2007 | 7651 |
| 2008 | 7245 |
| 2009 | 6813 |
| 2010 | 5762 |
| 2011 | 2685 |
| 2012 | 2813 |
| 2013 | 2847 |
| 2014 | 3086 |
| 2015 | 3449 |

Source: Economic Review various Years.

Table 3.32 narrates the declining trend of the registration of the number of engineering graduates in Kerala. This may be due to the fact that the new generation engineers prefer to go abroad rather than registering in Employment Exchanges. The job opportunities provided by the Employment Exchanges are temporary in nature. The graduate engineers prefer permanent posting.

## 3.12 Summary

The present study expounded the incidence of employment and unemployment in the world, India and Kerala. The study highlights that employment rate in the world was increasing though the labour force participation was declining. Educated

unemployment is acute in most of the countries. It concluded that there was a mismatch between skilled labourers and available workers. In India, upsurge in the number of total workers, creates a positive impact on economic reforms of employment and the percentage of employable Indian graduates is diminishing at an alarming rate every year. Female Labour Force Participation Rate (LFPR) was significantly lower as compared to LFPR among male. The Unemployment Rate (UR) of the youth is 4.9 per cent for rural areas and 9.2 per cent for urban areas as per 68$^{th}$round of NSSO. Engineering institutions were cumulating over the years in India and the percentage of the growth rate was also on the increase.

The problem of unemployment is chronic in state of Kerala. The national rate of unemployment as per the NSS 68$^{th}$ report indicated that in area wise data the unemployment rate was higher in rural areas as compared to urban areas. The number of institutions in the state for the period from 1950 to 2017 revealed an uneven growth of the engineering colleges in Kerala. Branch wise intake was higher in Kerala and preference of branches was changing year by year. Professional workers were smaller than the general work seekers in Kerala, while the professional work seekers were more in Kerala. The district of Thiruvananthapuram (5.2 lakh) ranked first in the number of work seekers in general and professional workers. Engineering education trained the person to become a noble person for profession and should be capable of handling the challenges of the emerging economy.

## 4.1 Introduction

An Overview of the employment and employability was discussed in chapter three. In the present chapter the trend and pattern of supply of engineering graduates from the year 2000 to 2016 is dealt with. As per objectives set up of the study, the first objective is to analyse the trend and pattern of engineering graduates in Kerala. For this we have used the data of the period from the year 2000 to 2016. The year 2000 and the preceding years marked a remarkable growth in the number of engineering institutions and a massive jump in the IT sector. Therefore,the researcher has selected the period from the year 2000 to 2016 for the study. The outturn rates of engineering graduates is taken from the data of National Technical Manpower Information System(hereafter NTMIS), Nodal Centre of Kerala, for the period 2000 to 2008.The data for 17 years (2000-2016) have been collected from the unpublished data, from the Universities of Kerala, Calicut, Kannur, Cochin and Mahatma Gandhi University and from the reports of Economics Review of Government of Kerala(2000-2016). All these data were combined for the analysis of the present study. The disproportionate growth in engineering education has resulted in an imbalance leading to the outturn of under skilled or unemployable manpower manifested in the form of a huge army of unemployed youth (Harikumar,2009). This chapter deals with the trend and pattern of supply of engineering graduates in Kerala and it is a modest attempt to correct this distortion in our understanding by systematically working out the trends in actual supply of engineers from the engineering colleges in Kerala.

## 4.2 Engineering Education in Kerala

Since the year 2000 many private engineering colleges were sanctioned in Kerala, as a result technical education had undergone outstanding changes. Engineering education in the state was fundamentally public funded and provided, right from the beginning until 2001. Most of them were government owned. Nevertheless, there existed a smaller number of government aided private engineering colleges subjected to the same enrolment policy as far as student admissions were concerned. The liberalization of technical education from 2001 dramatically increased the number of engineering colleges in the state (Mani &Arun, 2012). Kerala is one of the popular destinations for engineering students in India. Around 17,333 seats in engineering colleges were unfilled in 2016, indicating excess capacity that is affecting the quality of technical education in the State.

(The Hindu, July8, 2017). Kerala has one of the largest numbers of seats for undergraduate courses in engineering, especially when it is associated with the population of the state.

## 4.3 Engineering colleges in Kerala

Technical education department was established in the year 1957; however the first Engineering College in the State started functioning in the year 1939. From one institution in the year 1939, the number has grown to 156 when it reached the year 2013 and the seats from 21 to 52,000. The number of engineering institutions since 1940 in the state is given in Table 4.1.

**Table 4.1**

**Growth Profile of Engineering Institutions(Year Wise)**

| Year | Engineering Colleges | Annual growth (%) |
|---|---|---|
| 1940 | 1 | - |
| 1947 | 1 | 0 |
| 1950 | 1 | 0 |
| 1955 | 1 | 0 |
| 1960 | 4 | 60 |
| 1965 | 6 | 10 |
| 1970 | 6 | 0 |
| 1975 | 6 | 0 |
| 1980 | 6 | 0 |
| 1985 | 7 | 3.33 |
| 1990 | 9 | 5.71 |
| 1995 | 16 | 15.55 |
| 2000 | 36 | 25 |
| 2001 | 45 | 30.2 |
| 2002 | 77 | 71.11 |
| 2005 | 91 | 6.06 |
| 2008 | 94 | 1.09 |
| 2011 | 142 | 17.02 |
| 2014 | 163 | 4.92 |
| 2015 | 164 | 0.613 |
| 2016 | 183 | 11.58 |
| 2017 | 180 | -1.64 |
| 2018 | 183 | 1.66 |
| **Average** | **61.82** | **11.4** |

Source: NTMIS Bulletin and Commissioner of Entrance Examination, Kerala

Table 4.1 shows that real growth started from 1990's and continued till the last decade. Another exciting fact was that engineering colleges were increasing every year. In the engineering sector, private engineering colleges were having a mushrooming growth in Kerala till 2016. After 2016, some colleges were closed. Since then there were incidents of closing down of private engineering colleges or turning them into other productive activities, such as starting of unaided plus two courses, para medical courses and new courses in arts and science of the aided colleges. However, the emergence of engineering colleges was increasing in 2018.

### 4.3.1 Engineering Colleges in the Universities in Kerala

In recent years, there has been a remarkable increase in the number of engineering colleges especially in the form of private self-financing colleges. University-wise analysis shows that the maximum number of engineering colleges is in M G University situated in the district of Kottayam. The Institute of Human Resource Development (hereafter IHRD), Kerala, also conducts engineering courses. Table 4.2 encloses the list of engineering colleges under various universities in Kerala during the year 2000-2014 in three phases.

**Table 4.2**

**Engineering Colleges in the Universities of Kerala**

| SL.No. | Universities | Number of Colleges | | |
|---|---|---|---|---|
| | | 2000-01 | 2006-07 | 2013-14 |
| 1 | University of Kerala | 12 | 19 | 39 |
| 2 | Mahatma Gandhi University | 16 | 22 | 58 |
| 3 | University of Calicut | 6 | 18 | 34 |
| 4 | Kannur University | 2 | 5 | 7 |
| 5 | CUSAT | 8 | 18 | 24 |
| 6 | Agricultural University | 1 | 2 | 3 |
| Total | | 45 | 84 | 164 |

Source: Directorate of Technical Education, Thiruvananthapuram, Government of Kerala, (Various reports).

University-wise analysis shows that the maximum number of engineering colleges is in M G University (58), followed by the University of Kerala (39),Cochin University of Science and Technology (CUSAT) (24), University of Calicut (34), Kannur University (7), and the Agricultural University (3). There are nine Engineering Colleges functioning as self- financing institutions under IHRD. Before 2015, engineering colleges in Kerala used to be under various universities like Calicut University, Mahatma Gandhi University,

Cochin University, and Kerala University. But as of now, all engineering colleges other than in the University campuses themselves come under a single institution namely Kerala Technological University, which was later renamed as APJ Abdul Kalam Technological University. After 2014, majority of the engineering colleges were brought under the roof Kerala Technological University(KTU).

## 4.4 Expansion and Privatization of Engineering Education

Education is an important asset for the progress of human resources. It is significant for technical innovation and economic development. Providing education to all human beings is one of the primary objectives of the government. Privatization is one of the main global trends in higher education. It is generally understood as the intensive development and expansion of private institutions, increased reliance of public institutions on private funding, and operation of the institutions in a business like manner. Privatization denotes putting on market principles to the functioning of public institutions of higher education. As the ownership and management of the institutions remain with the public authorities, the services provided by the institutions are priced. The private sector implies the non-state sector in higher education. The institutions are owned and operated by private individuals or agencies. In most cases, this sector does not receive funding from the government and also it does not rely on the state funding for its growth and expansion, even though at times they receive partial public support in some countries (Varghese 2004).

The most visible trend has been the conversion in the provision of professional education, especially engineering, medicine and business schools. After 1990's, there were plentiful engineering colleges admitting more students each year. Many Government institutions turn out to be inadequate to cater to the demands of the industry and mostly with the implementation of the policy of liberalization and globalization. This forced the government to allow and facilitate the private to set up technical institutions on self-financing basis. Hence, there has been mushrooming of engineering institutions and it started with the opening up of new private engineering colleges in Kerala. This mushroom growth was opposed by the academic community at that time, as they thought this would decrease the standard of engineering education. Now, Kerala produces engineering graduates from 183 engineering institutions annually. The quality of education in the private colleges is meagre. Many of these colleges lack even basic facilities essential for

good engineering education and do not have qualified teachers. But on the other hand, some have excelled well and are even better than the Government engineering colleges today. In spite of the varying quality education standards, Kerala has been contributed immensely for this growth. Infact, the provision of technical education was reserved for a few truly outstanding institutions, with a consideration that they would bring depth and variety into the education system.

After the liberalization period, the government of Kerala decided to reassure 'full-fledged private- private participation in the sector, by allowing self- financing or unaided colleges. It opened the flood gates to the higher education sector to private parties who have different kinds of interests, including non-philanthropic and even purely commercial interests. Further, in 2000 the government decided to "grant 'no objection certificates' to any private agency that approached it for permission to start an unaided professional college" (Government of Kerala 2006, p. 93). Privatization of higher education has given a major thrust to professional and technical education in the state. Thus, the government policy of encouraging private participation in education, led to the explosion of colleges of professional and technical education. Therefore, it is rightly held by many that the growth in higher education in the state is essentially due to the growth of self-financing colleges, which can actually be called student-financed or fee-based institutions. The rapid growth in self-financing private sector, led to the diminution of public sector and public sector displacement in a big way. Number of students in government and government-aided colleges is found to be declining, as the students are shifting to self-financing colleges. Self-financing colleges have become a big phenomenon in Kerala. In 1991, there were no self-financing colleges in Kerala in any discipline. Government and government-aided private institutions remained as a minority in the Technical Education. In 2012-13, the self-financing colleges formed 58 per cent of all engineering colleges in the state.

In Kerala, self-financing engineering colleges were functioning not only under private sector, but also under government sector in the form of new branches and add on-courses. The main agencies in the government's self-financing sector are the Institute of Human Resource Development (IHRD) and LBS Centre for Science and Technology. There are also self-financing colleges under the government sector under several bodies such as Kerala State Road Transport Corporation(KSRTC), CAPE (Co-operative Academy of Professional Education), Centre for Continuing Education Kerala (CCEK), and Academy of Medical Sciences (KNM). The Non-resident Keralites Department of the

Government of Kerala (NORKA) also has recently announced their plan to start self-financing professional colleges definitely for the benefit of non-resident Keralites. Further, there are also self-financing colleges under state universities and under private deemed universities. In addition, there are self-financing private colleges and such colleges are under private agencies such as Kerala Catholic Engineering College Managements' Association. To check the problem of lack of social control of the government over the private self-financing institutions, the government promoted the formation of student-funded professional colleges in the cooperative sector. The societal control on many of these institutions is debatable (Kumar and George 2009).

## 4.5 Intake and Outturn of Engineering Students

Intake and outturn of engineering students were substantial components in engineering graduation. After 2000, the numbers of engineering graduate joined in engineering colleges were started growing and at that time the preference of engineering education was expanding. The intake and outturn for three cohorts of students from 2004 to 2006 showed that while intake had grown fast, outturn rate had not increased at the same pace. The results for the year 2006 showed considerable decrease in outturn rate.

The pass percentage of engineering students in a year in various branches is called outturn rates. In Kerala, outturn rates showed a significant reduction in the engineering courses. It elucidates that intake capacity of the engineering education was not led to development in output. This could be due to various reasons. The first reason is that half of the students, who enroll for engineering graduation, join the course because of the pressure and force from parents and relatives. They may not be interested in the course rather they study the course for the prestige issue. This reflects in the results of the examinations held. The second reason could be that as the self –financing engineering institutions mushroom in Kerala, quality of the students are compromised. The students who get intake even below 10 out of hundred are admitted to the engineering stream by self-financing colleges in Kerala. In the case of the 'seats 'of the management, they are often offered to the students who secure low marks in the entrance exam.

**Table 4.3**
**Total Intakes and Outturn of Engineering Graduates in Kerala**

**(2000-2016)**

| Year | Intakes (Number of Engineering Graduates) | Annual Growth Rate (%) | Outturn (Number of Engineering Graduates) | Annual Growth Rate (%) |
|---|---|---|---|---|
| 2000 | 8820 | | 4894 | |
| 2001 | 11045 | 25.22 | 5143 | 5.08 |
| 2002 | 18428 | 66.84 | 3572 | -30.54 |
| 2003 | 19341 | 4.95 | 8025 | 124.66 |
| 2004 | 21448 | 10.89 | 8361 | 4.18 |
| 2005 | 25124 | 17.14 | 9026 | 7.95 |
| 2006 | 28635 | 13.97 | 10206 | 13.07 |
| 2007 | 30774 | 7.46 | 11504 | 12.71 |
| 2008 | 32383 | 5.23 | 12392 | 7.71 |
| 2009 | 34473 | 6.45 | 13912 | 12.26 |
| 2010 | 36218 | 5.06 | 15213 | 9.35 |
| 2011 | 38691 | 6.83 | 15998 | 5.16 |
| 2012 | 40879 | 5.65 | 19717 | 23.24 |
| 2013 | 42111 | 3.01 | 20777 | 5.37 |
| 2014 | 42886 | 1.84 | 22233 | 7.01 |
| 2015 | 58237 | 35.79 | 20868 | -6.13 |
| 2016 | 60376 | 3.67 | 24998 | 19.79 |

Source: NTMIS nodal center for Kerala (Various Issues), Unpublished data on various Universities

Table 4.3 shows the pathetic situation of outturn rates. The outturn rate (hereafter OTR), was almost 5.08 per cent for the year 2001. In the same year the growth per cent was 25.22. This means that one out of every five students who join the four-year degree programme in engineering either drops out, or fails in the exams, resulting in low OTR. This has serious consequences in the actual supply of engineers.

At the end of the 1990s, real growth in capacity and intake started and continued till 2018. The engineering colleges were largely developing in the year 2000 and most of the colleges were private sector. Although the colleges were distributed across all the 14 districts of the state, approximately half of them were located in the three districts of Trivandrum, Kollam and Ernakulam. Approximately 50 per cent of the colleges are

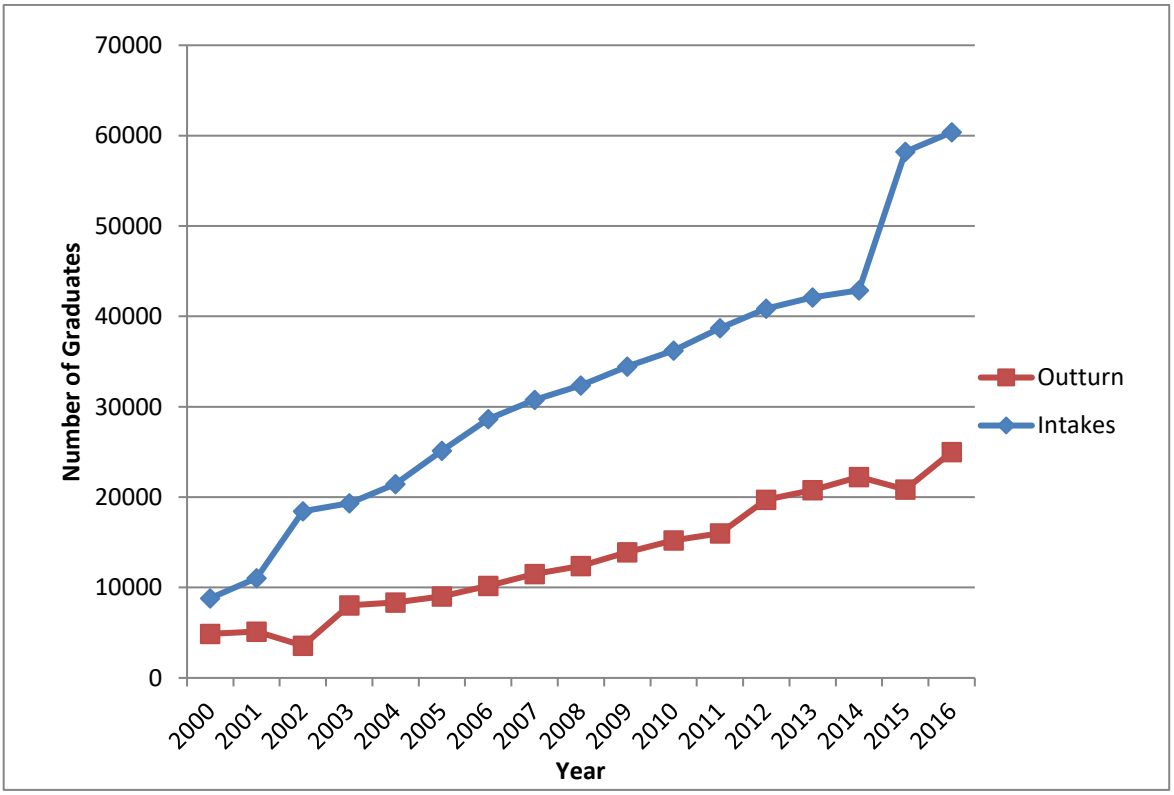
affiliated to two of the universities, namely, University of Kerala and Mahatma Gandhi University.

### 4.5.1 Trend and Pattern of Intake and Outturn of Engineering Graduates, (2000-2016).

The intakes and outturn of engineering graduates were fluctuating year by year. Students enrolling for undergraduate engineering courses in the Kerala displayed that outturn rates have actually come down significantly and a branch-wide analysis showed that there had been a significant reduction in the rate of outturn in the more popular branches (AICTE, Report, 2017). Figure 4.1 narrates the trend and pattern in intake and outturn of engineering graduates in Kerala.

**Figure 4.1**

**Trend and Pattern of Intake and Outturn of Engineering Graduates**




Source: NTMIS nodal Centre for Kerala (2000-2016), unpublished data from Universities of Kerala, Kannur, Cochin University, MG University and Calicut University

Figure 4.1 illustrates that there is an increasing trend in intakes of engineering graduates over the years from 2000-2016. However, outturn rates of engineering graduates were changing every year. Outdated branches such as Electrical and

Electronics, Civil and Mechanical have gone considerably down in learner preferences. Electronics and Communication, Computer Science and Engineering and Information Technology have taken up the share vacated by these three branches. In fact, Electronics and Communication has become the most preferred branch although the fastest growth rate is in Information Technology. Irrespective of the branch, majority of the students who graduate have been finding jobs in the IT services where their previous training or background has become irrelevant. Notwithstanding remarkable increases in enrolments or intake, the actual supply of engineers has been substantially less, reason due to the high rates of failures and dropouts. (CDS Working paper, 448).

## 4.6 Gender wise Total Intakes of Students of the Engineering Degree

In gender wise classification, total intakes were fluctuating year by year. In Kerala, students accept and get admitted to the engineering courses for the sake of the prestige value associated to it. After the emergence of diversity in the branches offered, more students are attracted. The total intakes of the students are described in table 4.4.

**Table 4.4**
**Gender wise Total Intakes of Engineering Degree Course (%)**

| Year | Boys | Girls |
|---|---|---|
| 1999-2000 | 67.70 | 32.30 |
| 2000-2001 | 64.30 | 35.70 |
| 2001-2002 | 62.19 | 37.81 |
| 2002-2003 | 63.29 | 36.71 |
| 2003-2004 | 64.77 | 35.23 |
| 2004-2005 | 65.21 | 34.82 |
| 2005-2006 | 66.38 | 35.13 |
| 2006-2007 | 66.53 | 35.84 |
| 2007-2008 | 66.79 | 36.24 |
| 2008-2009 | 65.84 | 36.81 |
| 2009-2010 | 64.25 | 37.02 |
| 2010-2011 | 62.54 | 35.18 |
| 2011-2012 | 60.27 | 39.73 |
| 2012-2013 | 61.45 | 38.54 |
| 2013-2014 | 58.91 | 41.08 |
| 2014-2015 | 61.25 | 38.74 |
| 2015-2016 | 63.14 | 36.86 |

Source: Annual Technical Manpower Review of Kerala (1999-2010), Economic Review (2008-2017)

Table 4.4 illustrates that the intakes of boys are higher than girls for the engineering courses. Intakes of boys were fluctuating over the years than girls. Comparing boys, girl students' growth rate were changing year by year and slightly declining 2015-16. In Kerala, more students were attracted to engineering stream but the outturn rates were questionable one.

After the period of liberalization, there were more changes in actual intakes of engineering students, though there was a declining trend. While the total approved intake capacity of the engineering colleges in Kerala in 2017-18 was 55665, the actual intake had come down to 30195, showing that approximately 25470 seats in various disciplines were vacant in 2017-18(AICTE Report, 2018).

## 4.7 Branch Wise Intakes of Engineering Colleges in Kerala (2000-2016)

The branch wise intakes of engineering graduate students in Kerala for the period from the year 2000 to 2016 are analyzed in this section. The branch wise classification clearly brought out the finding that there was a consistent increase in the intake of engineering students for the period of analysis of the secondary data. Over the years additional engineering students were enrolling themselves into branches such as Electronics and Communication, Computer Science and Engineering, Mechanical, Electrical and Electronics and Information Technologywith renewed vigor and vitality. The engineering institutions also were increasing during the period from the year 2000 to 2016. The branch wise intakes are attached in AppendixVI.

Although there were 29 branches in the year 2016 in the engineering education in Kerala, five branches (Electronics and Communication, Computer Science and Engineering, Mechanical, Electrical and Electronics and Information Technology) accounted for about 75 per cent of the intake. However, in 2016 the top five branches (Electrical and Electronics, Mechanical, Civil, Electronics and Communication and Computer Science and Engineering) accounted for about 85 per cent of the intake. Interestingly, the concentration had come down with the emergence of a number of new branches, such as Information Technology being one of the newly emerging branches. Admissions to traditional branches such as Electrical and Electronics, Civil and Mechanical have gone considerably down in student preferences. Electronics and Communication, Computer Science and Engineering and Information Technology have

taken up the share vacated by these three branches. In fact, the branch Electronics and Communication has become the most preferred branch although the fastest growth rate is in Information Technology.

### 4.7.1 Application of Statistical Tools into the Intake of Engineering Students in Kerala

In the present analysis a cubic equation $f(x)= ab^3+bb^2+cb+d$ where $a\neq0$ is used to fit. The graph of a cubic function has a single inflection point and has two critical points, a local minimum and a local maximum. Since the present study has 29 branches, the local minimum and the local maximum vary with the respective branches and years under consideration. The model descriptions of total branch wise intakes are given in table 4.5.

**Table 4.5**

**Model Description**

| | | |
|---|---|---|
| Model Name | | MOD_11 |
| Dependent Variable | 1 | Intakes |
| Equation | 1 | Cubic |
| Independent Variable | | Year |
| Constant | | Included |
| Variable Whose Values Label Observations in Plots | | Unspecified |
| Tolerance for Entering Terms in Equations | | .0001 |

Source: Secondary Data Analysis

Table 4.5 elucidates that intake was the dependent variable and year was an independent variable. In equation $f(x) = ab^3+bb^2+cb+d$ where $a\neq0$. $b^1$, $b^2$, $b^3$ are coefficients and a, b, c and d are numbers representing the independent variables. The model summary of each branches and the parameters of each branches are explained in table 4.6.

## Table 4.6
## Model Summary and Parameter Estimates

| Dependent Variable: Intakes | | | | | | | |
|---|---|---|---|---|---|---|---|
| Branch | Equation | Model Summary | | | | | Parameter Estimates |
| | | R Square | F | df1 | df2 | Sig. | Constant |
| Applied Electronics and Instrumentation | Cubic | .928 | 55.940 | 3 | 13 | .000 | 775.353 |
| Agriculture Engineering | Cubic | .960 | 105.023 | 3 | 13 | .000 | 37.118 |
| Architecture | Cubic | .950 | 82.410 | 3 | 13 | .000 | 226.706 |
| Automobile Engineering | Cubic | .949 | 80.178 | 3 | 13 | .000 | 185.809 |
| Bio-medical Engineering | Cubic | .994 | 779.642 | 3 | 13 | .000 | 96.294 |
| Bio-Technology | Cubic | .989 | 373.146 | 3 | 13 | .000 | 103.529 |
| Civil Engineering | Cubic | .821 | 19.926 | 3 | 13 | .000 | 712.176 |
| Chemical Engineering | Cubic | .992 | 513.322 | 3 | 13 | .000 | 119.029 |
| Computer science and Engineering | Cubic | .899 | 38.476 | 3 | 13 | .000 | 2736.647 |
| Diary Science and Technology | Cubic | .977 | 184.823 | 3 | 13 | .000 | 58.382 |
| Electronics and Communication | Cubic | .899 | 38.476 | 3 | 13 | .000 | 2736.647 |
| Electrical and Electronics | Cubic | .987 | 340.086 | 3 | 13 | .000 | 212.353 |
| Electronics and Instrumentation | Cubic | .985 | 285.547 | 3 | 13 | .000 | 96.618 |
| Food Technology | Cubic | .862 | 27.032 | 3 | 13 | .000 | 41.471 |
| Instrumentation and Control Engineering | Cubic | .916 | 47.494 | 3 | 13 | .000 | 93.676 |
| Industrial Engineering | Cubic | .922 | 51.496 | 3 | 13 | .000 | 24.265 |
| Information Technology | Cubic | .977 | 187.954 | 3 | 13 | .000 | 676.676 |
| Mechanical(Automobile) | Cubic | .977 | 183.371 | 3 | 13 | .000 | 57.941 |
| Mechanical Engineering | Cubic | .965 | 120.573 | 3 | 13 | .000 | 1639.250 |
| Mechanical(Product | Cubic | .958 | 100.056 | 3 | 13 | .000 | 35.147 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ion Engineering) | | | | | | | |
| Polymer Engineering | Cubic | .952 | 85.659 | 3 | 13 | .000 | 65.147 |
| Production Engineering | Cubic | .918 | 48.772 | 3 | 13 | .000 | 19.853 |
| Printing Technology | Cubic | .627 | 7.299 | 3 | 13 | .004 | 95.735 |
| Aeronautical Engineering | Cubic | .985 | 290.842 | 3 | 13 | .000 | 222.794 |
| Safty and Fire Engineering | Cubic | .951 | 83.701 | 3 | 13 | .000 | 32.412 |
| Food Engineering | Cubic | .967 | 128.571 | 3 | 13 | .000 | 30.000 |
| Mechatronics Engineering | Cubic | .978 | 192.391 | 3 | 13 | .000 | 79.294 |
| Metallurgy | Cubic | .960 | 102.723 | 3 | 13 | .000 | 24.676 |
| Naval Architecture and ship Building | Cubic | .884 | 33.152 | 3 | 13 | .000 | 35.147 |

Source: Secondary Data Analysis

Table 4.6 exposed the R square and F ratio of the branches under study and the degrees of freedom. The results show that each branch R square value are close to one. This shows that the intakes of all the branches are having an increasing trend. The high values of the R square are an indication of the strong relationship between the variables intake and year with respect to the 29 branches of engineering education in Kerala. Since P value of all the branches are 0.000 which is a clear indication of a strong level of significance for all the branches under consideration. It is a clear evidence that the intake of all the branches were increasing year after year from the year 2000 to 2016 consecutively. Though the intake was increasing the outturn was not proportionate with the intake. This is one of the major problems faced by the engineering sector of Kerala. The analysis shows that the outturn of candiadtes were decreasing because of various reasons. This may be due to the fact that students who enter into the stream of engineering do not possess the sufficient skill and aptitude to pursue the engineering studies. The students opt for engineering not out of genuine interest but out of force from parents and the attraction accrued from this profession.

# Table 4.7

**Model Summary and Parameter Estimates**

| Dependent Variable: Intakes | | | | |
|---|---|---|---|---|
| Branch | Equation | Parameter Estimates | | |
| | | b1 | b2 | b3 |
| Applied Electronics and Instrumentation | Cubic | -75.102 | 23.704 | -1.096 |
| Agriculture Engineering | Cubic | 3.055 | -.331 | .011 |
| Architecture | Cubic | 91.974 | -9.939 | .465 |
| Automobile Engineering | Cubic | 34.517 | -2.744 | .116 |
| Bio-medical Engineering | Cubic | 6.675 | -.156 | .022 |
| Bio-Technology | Cubic | -9.496 | 2.906 | -.098 |
| Civil Engineering | Cubic | 481.305 | -59.670 | 3.839 |
| Chemical Engineering | Cubic | -.551 | 3.079 | -.144 |
| Computer science and Engineering | Cubic | 6.609 | 26.958 | .049 |
| Diary Science and Technology | Cubic | -3.037 | 1.701 | -.066 |
| Electronics and Communication | Cubic | 6.609 | 26.958 | .049 |
| Electrical and Electronics | Cubic | 247.614 | -6.582 | .217 |
| Electronics and Instrumentation | Cubic | -9.076 | 2.644 | -.093 |
| Food Technology | Cubic | -9.025 | 1.509 | -.054 |
| Instrumentation and Control Engineering | Cubic | -4.708 | 1.129 | -.046 |
| Industrial Engineering | Cubic | 1.674 | .755 | -.037 |
| Information Technology | Cubic | 22.268 | 33.842 | -1.819 |
| Mechanical(Automobile) | Cubic | -.140 | 1.054 | -.032 |
| Mechanical Engineering | Cubic | 625.216 | -101.512 | 5.895 |
| Mechanical(Production Engineering) | Cubic | 1.109 | 1.059 | -.049 |
| Polymer Engineering | Cubic | -4.452 | .771 | -.021 |

| | | | | |
|---|---|---|---|---|
| Production Engineering | Cubic | 2.196 | .921 | -.049 |
| Printing Technology | Cubic | -37.277 | 9.341 | -.441 |
| Aeronautical Engineering | Cubic | 21.107 | .953 | -.056 |
| Safty and Fire Engineering | Cubic | 4.163 | .115 | -.009 |
| Food Engineering | Cubic | 24.310 | -1.299 | .028 |
| Mechatronics Engineering | Cubic | -6.929 | 1.549 | -.052 |
| Metallurgy | Cubic | 2.874 | .273 | -.013 |
| Naval Architecture and ship Building | Cubic | 3.268 | .215 | -.013 |

Source: Secondary Data Analysis

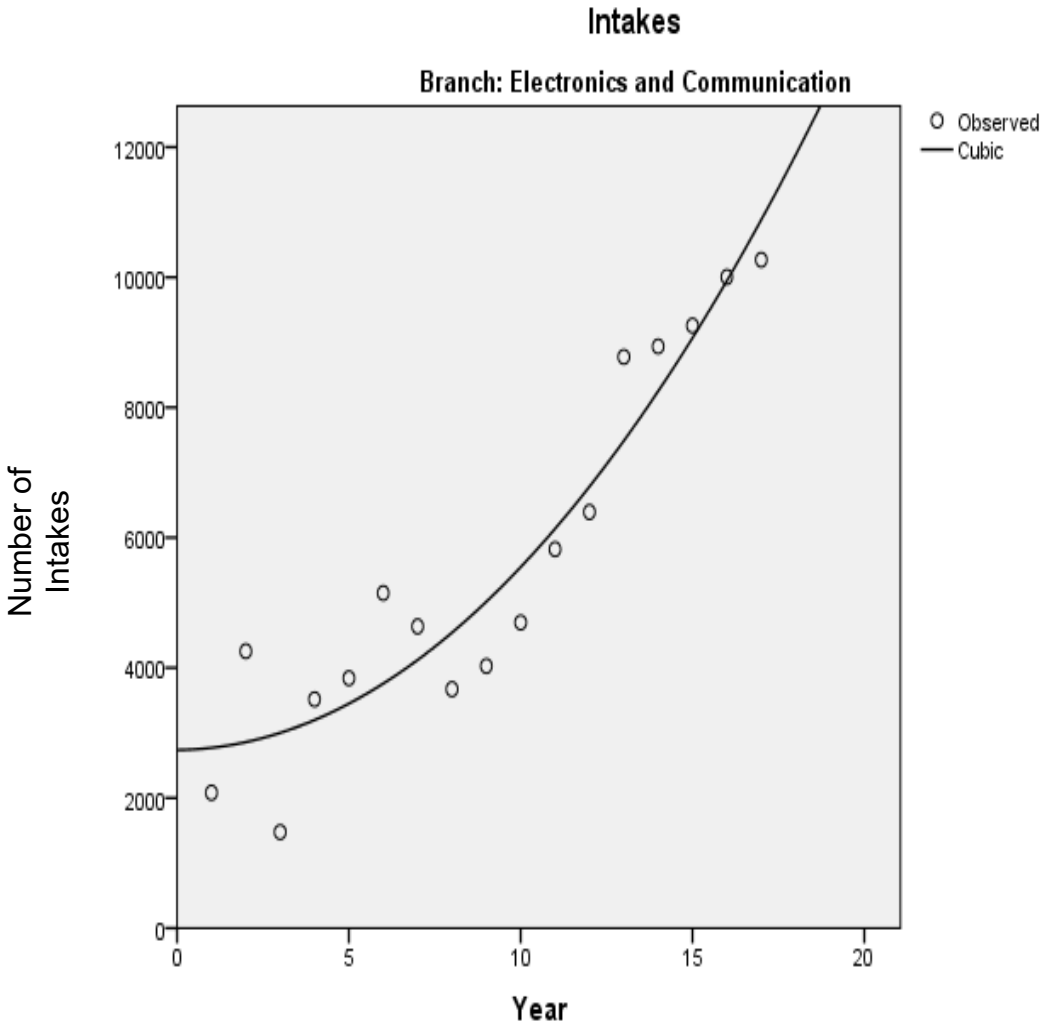
Table 4.7 explicates the parameter estimates of total intakes of each branch. As explained in 4.6.3.1 the cubic equation used for the analysis is $f(x)= ab^3+bb^2+cb+d$ where $a\neq0$. The values of b1, b2, and $b_3$ are the coefficients of the 29 branches of engineering degree. When two coefficients are positive and one negative, the curve fitted, first moves upward and then goes downward which is a clear sign of variations in the dependent variable. Since there are 29 branches, the curve fitted through the cubic equations revealed that there were wide variations in the dependent variable intake whereas in the case of independent variable 'year' disclosed that there was an upward trend in the intake of students of engineering. On the whole, the analysis brought to the notice that the intake had a positive growth rate which was evident from the curve fitted.

### 4.7.2 Diagrammatic Expression of Branch wise Intake

The total intakes of the important branches (Electronics and Communication, Mechanical Engineering, Civil Engineering, Computer Science Engineering and Electrical and Electronics Engineering) which are preferred with great interest by the students are given in the figures starting from 4.2 to 4.6.

## Figure 4.2

## Intakes of Electronics and Communication Engineering

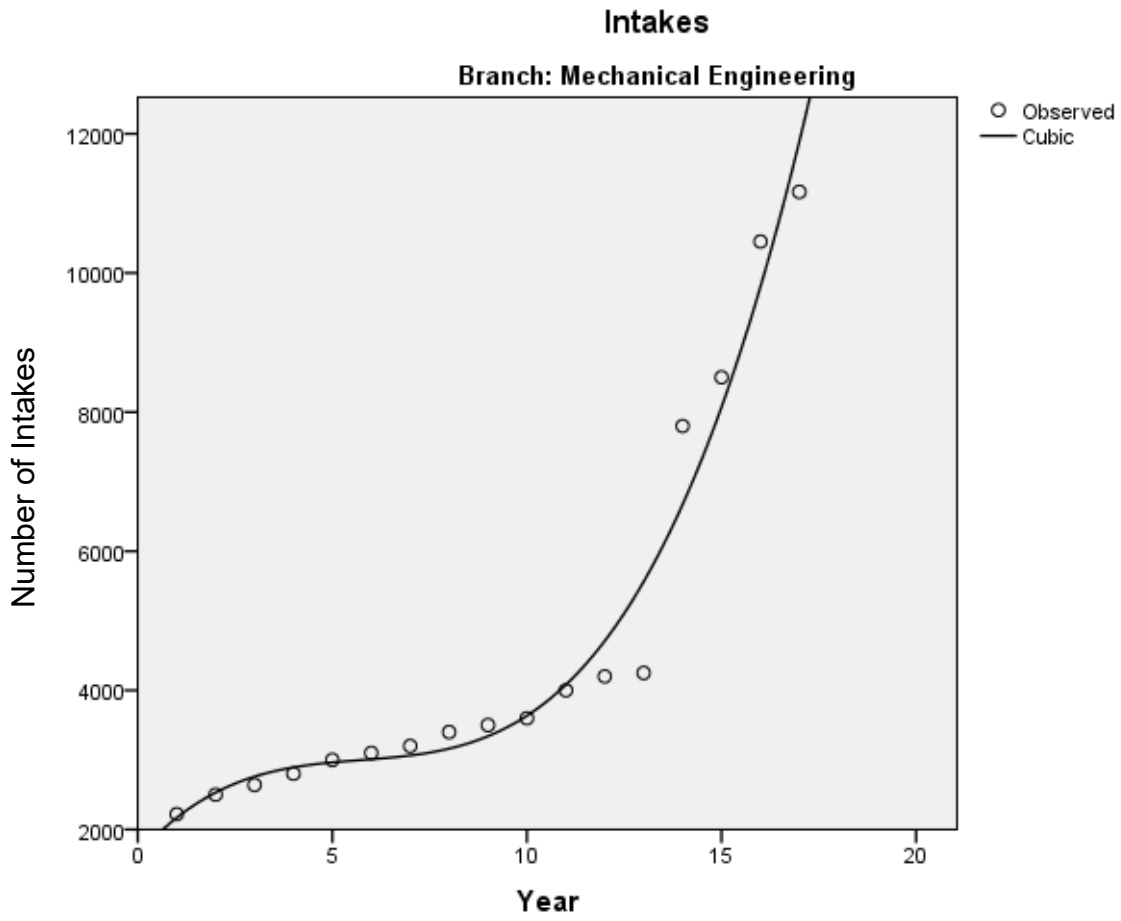



Source: Secondary Data(2000-2016)

The trend line fitted through the curve shows an increasing trend. The intakes of Electronics and Communication Engineering had increased due to the attraction of availability of job opportunities and preference of the students. Figure 4.2 substantiates that there are wide fluctuations in the intakes of this branch. In the year 2000, the intake was 2035 and it increased to 12063 in the year 2016. A non-linear trend line was fitted into the data (2000-2016).

## Figure 4.3

## Intakes of Mechanical Engineering

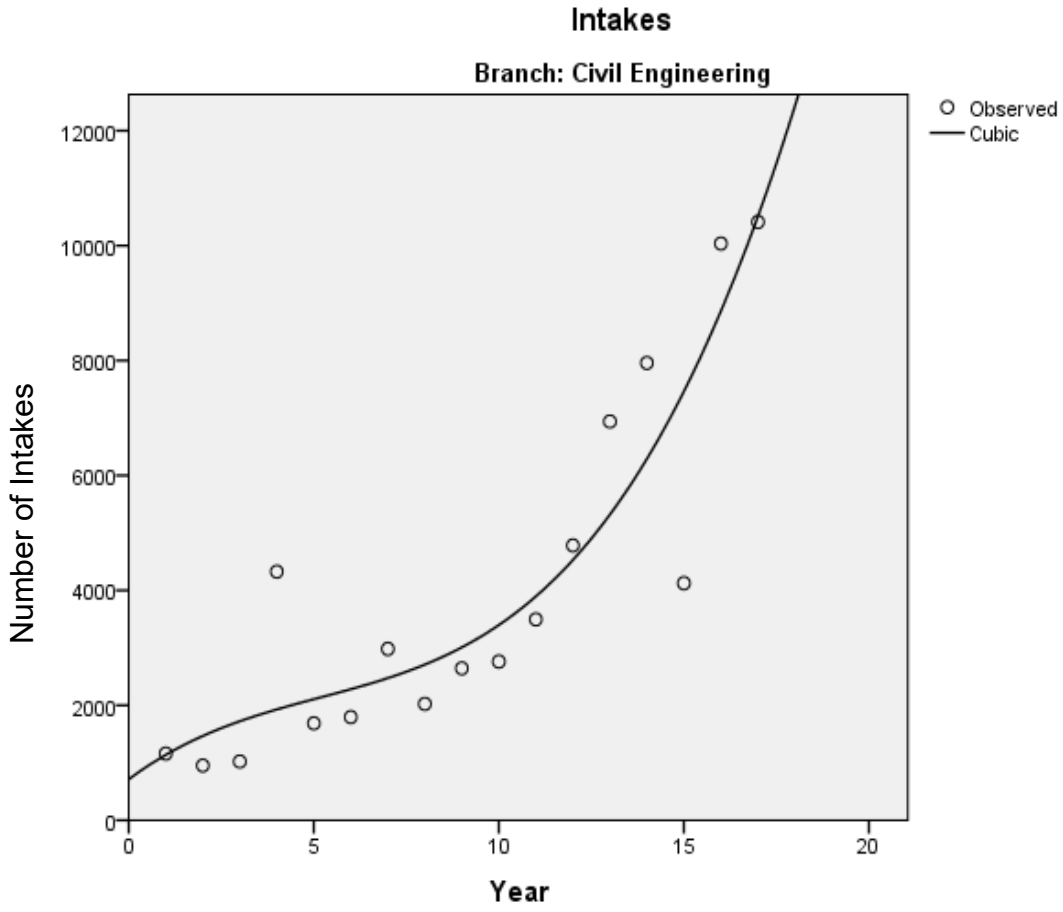



Source: Secondary Data (2000-2016)

The trend line fitted through the curve shows an increasing trend. The intakes of Mechanical Engineering have increased due to the attraction of availability of good job opportunities and preferences of the students of engineering. Figure 4.3 substantiates that there are wide fluctuations in the intakes of this branch. In the year 2000, the intake was 2221 and it increased to 11165 in the year 2016. A non-linear trend curve was fitted into the data of the period from the year 2000 to 2016.

## Figure 4.4

## Intakes of Civil Engineering

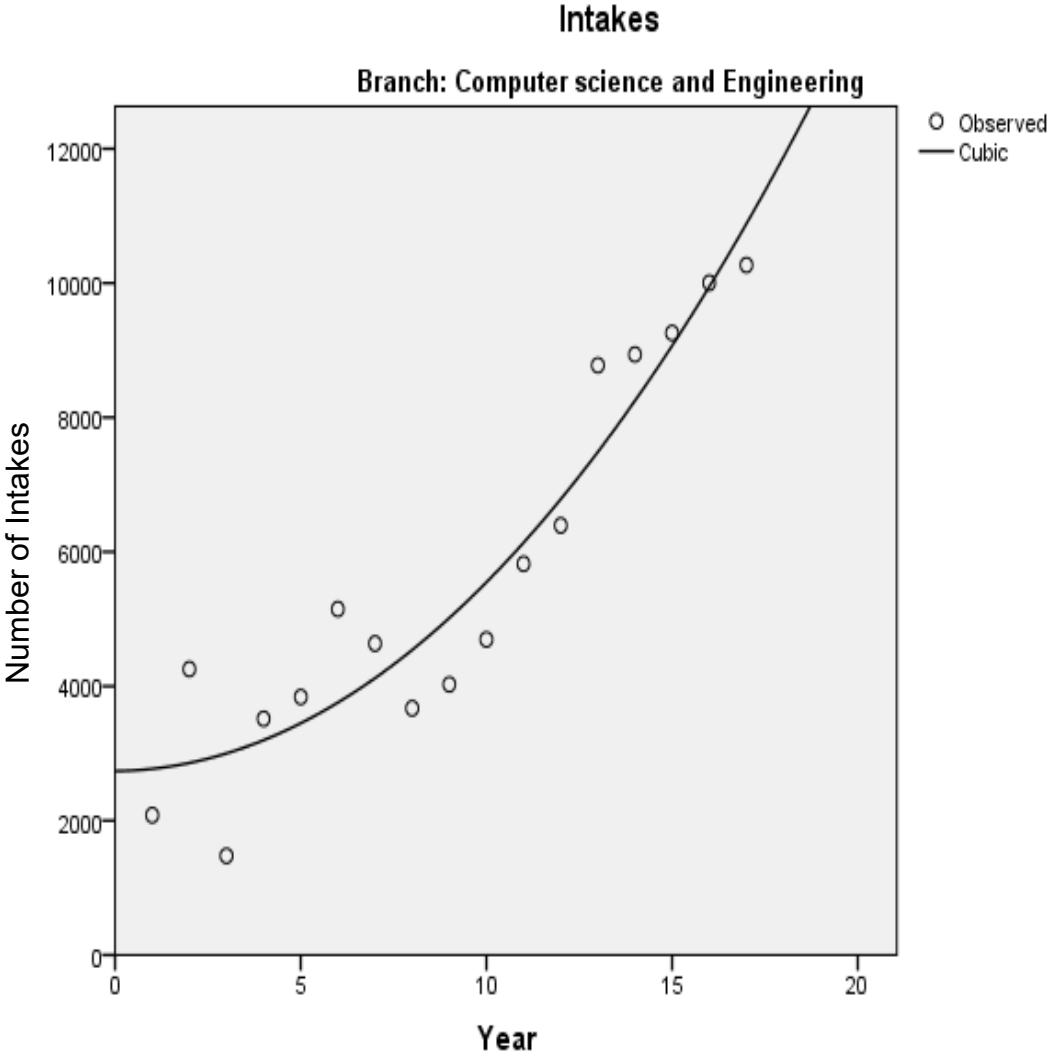



Source: Secondary Data (2000-2016)

In section 4.4 it was found out that the highest growth rate of engineering branch wise intake from 2000 to 2016. The trend line in figure 4.8 shows fluctuations in general. Though there are variations in the curve the general movement is upward. The intake of engineers in CivilEngineering branch in the year 2016 is 10269. During the years 2008 and 2016 high intakes are recorded.

## Figure 4.5

## Intakes of Computer Science Engineering

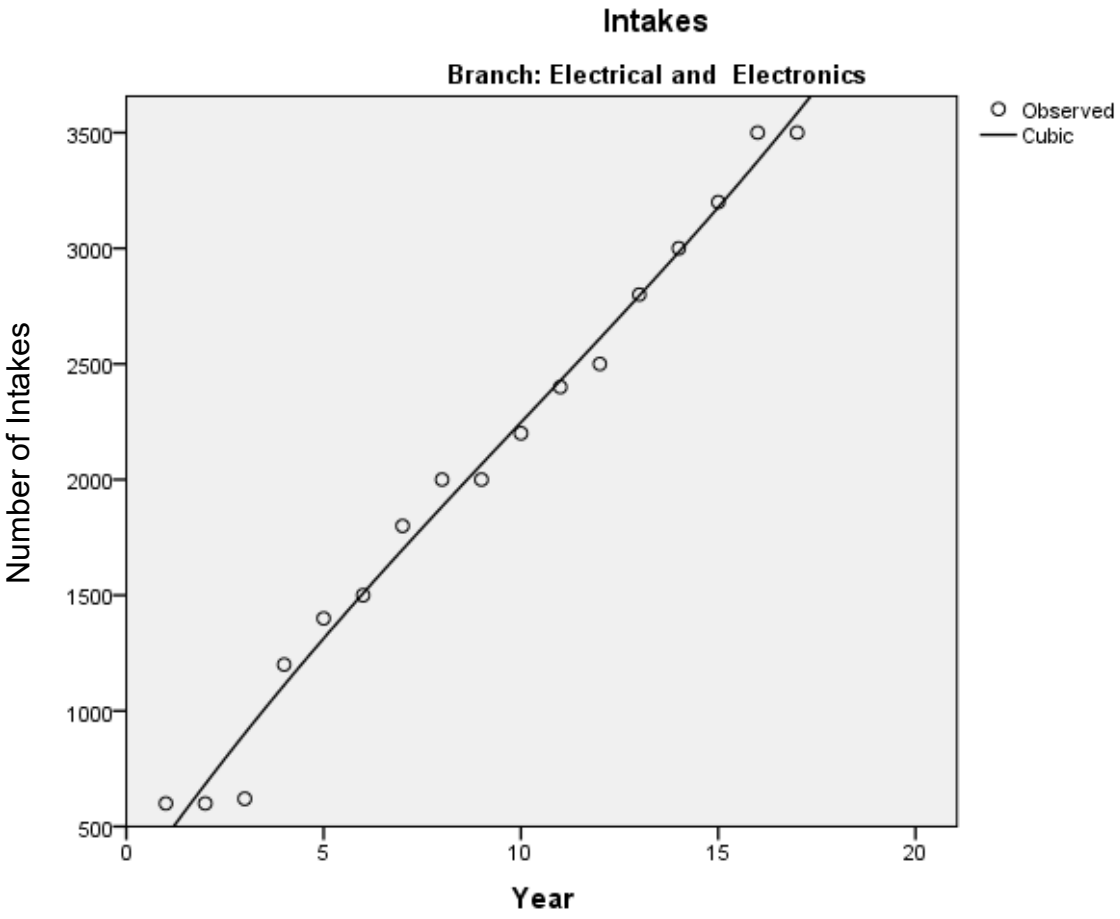



Source: Secondary Data (2000-2016)

As explained in section 4.5, the highest growth rate of branch wise intake of engineering students from the year 2000 to 2016 was recorded for the branch of Computer Science Engineering.

## Figure 4.6

## Intakes of Electrical and Electronics




Source: Secondary Data (2000-2016)

The figure 4.6 explains the trend of the growth of Electrical and Electronics branch in the engineering education of Kerala. The trend line fitted through the growth curve of Electrical and Electronics branch showed that there was an increase in the intake of this branch in Kerala. The trend line in general showed a non-linear trend. From the year 2000, there was a fluctuation in the growth of the students of engineering. A peak was experienced in the year 2007 and in the next year a fall was recorded in intakes.

To conclude the section on the rate of intake, it was observed that intakes were increasing year by year in each branch. The branches which marked highest intakes in 2016 such as Electronics and Communication, Mechanical Engineering, Civil Engineering, Computer Science Engineering and Electrical and Electronics Engineering

had better rates of enrollment .The newly emerged branches were Metallurgy, Mechanical Engineering and Naval Architecture and Ship building.

### 4.7.3 Regression Analysis in Total Intakes

A Regression analysis of total intakes and outturn was done with various years. Regression analysis is a statistical method used to examine relationship between two or more variables of interest. It is a relationship between one dependent variable (denoted by Y) and a series of other changing variables (known as independent variables).

**Table 4.8**

**Model Summary and Parameter Estimates of Total Intakes**

| Dependent Variable: Total Intake | | | | | | | |
|---|---|---|---|---|---|---|---|
| Equation | Model Summary | | | | | Parameter Estimates | |
| | R Square | F | df1 | df2 | Sig. | Constant | b1 |
| S | .903 | 140.418 | 1 | 15 | .000 | 209.413 | -399876.213 |
| The independent variable is Year. | | | | | | | |

Source: Secondary Data Analysis

Table 4.8 displays the model summary and parameters of total intakes from engineering graduates in Kerala over the last seventeen years.The equation of non- linear regression is listed below:

$$Y= \exp( 209.4130344693029 + -399876.2129522731 / x)$$

Where Y=dependent Variable

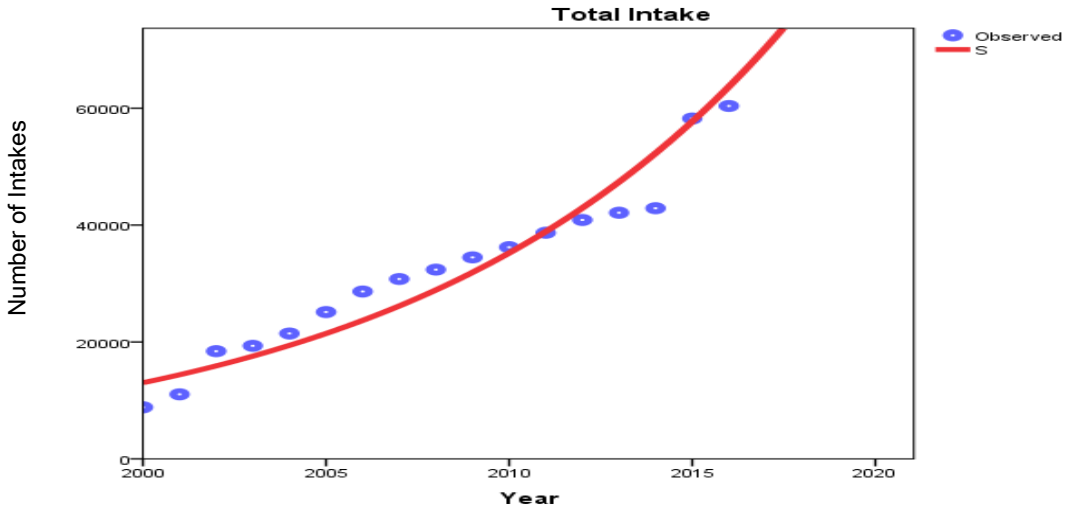
X=Independent Variable.

Here, total intakes are taken as dependent variable and year as the independent variable. R square is .903, this model appeared to be the best. The model summary table reports the strength of the relationship between the model and the dependent variable R, there is a non-linear correlation between the observed and model predicted values of the dependent variable. Its large value (.903) indicates a strong relationship between the variables. R

Square, the coefficient of determination, is the squared value of the multiple correlation coefficients. It was found that R square and F ratio have 0.903 and 140.41 value respectively. As a whole, the regression does a good job of modeling the analysis of the relationship between intake and year of the data.

**Figure 4.7**

**Total Intake of Engineering Graduates**




Source: Secondary Data Analysis

Figure 4.7 elucidates that there is non-linear trend in total intake of engineering graduates. The trend line shows that there is no linear trend in data. The data related to the intakes of students were fluctuating year after year. Having explained the trend of the intake of students, the study proceeds to the trend of the outturn of engineering students. Table 4.6 explains summary of the estimates of the outturn of engineering students.

## 4.8 Regression Analysis in Total Outturn

The next we analyzed the total outturn of engineering degree holders in Kerala. The result of the analysis is given in table 4.9.

## Table 4.9

## Model Summary and Parameter Estimates of Total Outturn

| Dependent Variable: Total Outturn | | | | | | | |
|---|---|---|---|---|---|---|---|
| Equation | Model Summary | | | | | Parameter Estimates | |
| | R Square | F | df 1 | df2 | Sig. | Constant | b1 |
| S | .924 | 181.324 | 1 | 15 | .000 | 229.489 | -442016.689 |
| The independent variable is Year. | | | | | | | |

Source: Secondary Data Analysis

Table 4.9 displays that the R square value is .924, and the equation of non- linear regression is as follows:

Y= exp( 229.4891946019607 + -442016.6893571553 / x )

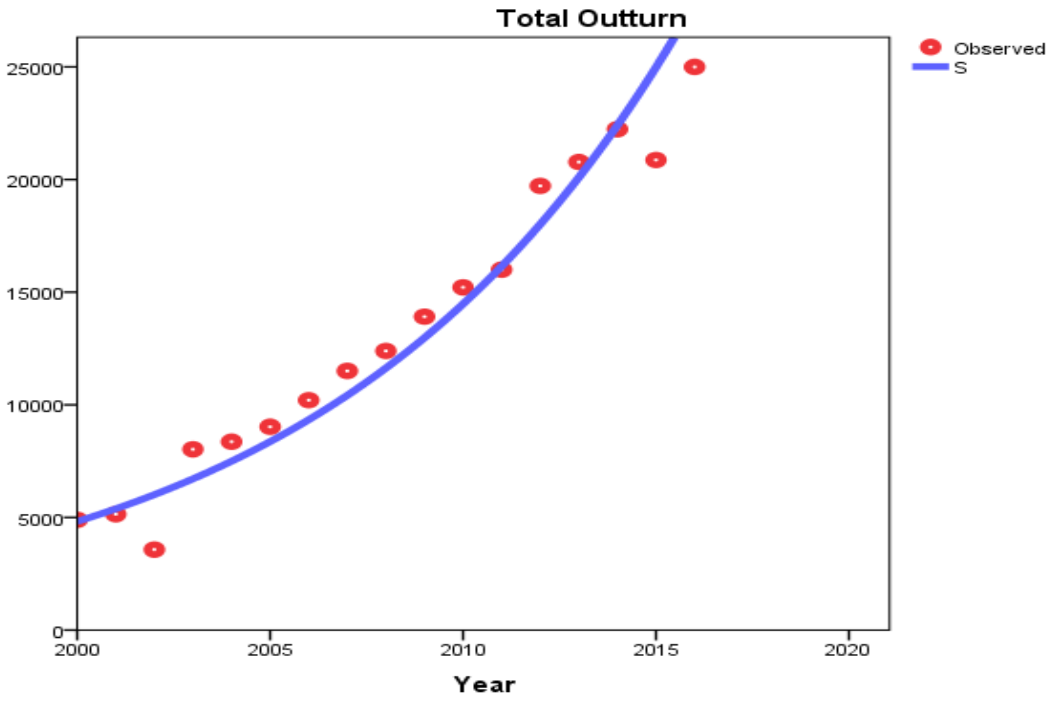
Where Y=dependent Variable

X=Independent Variable

The total outturn was dependent variable and year was the independent variable.The model summary table reports the strength of the relationship between the model and the dependent variable R, there is an non-linear correlation between the observed and model predicted values of the dependent variable. Its large value (.924) indicates a strong non-linear relationship. R Square, the coefficient of determination, is the squared value of the multiple correlation coefficients. It was found that R square value and F ratio have 0.924 and 181.32 values respectively. As a whole, the regression does a good job of modelling the relationship between year and outturn of engineering students. This clearly points out that the outturn of engineering graduates have increased but at a decreasing rate taking into consideration, the intake of students.

**Figure 4.8**

**Total Outturn of Engineering Graduates**




Source: Secondary Data Analysis

Figure 4.8 points out that the trend of the analysis is in non-linear form. It indicates that total outturn was fluctuating year by year. Every year there was a change in the outturn rates of engineering graduates. Cubic form is used for analysis of regression. The trend line fitted through the curve of total outturn of engineering graduates shows that there are significant variations (increasing and decreasing) in the data analysed.

### 4.8.1 Result of First Hypothesis

The first hypothesis of the study stated that 'the variable supply of engineering graduates in Kerala decreases due to the disproportionate distribution between the intake and outturn of engineering graduates. The supply of engineering graduates is the outturn of passed out students.The test of regression came out with the finding that outturn does not increase as the intake due to the failures in examinations, dropouts, lack of interest, poor learner quality and aptitude, lack of quality teaching, paucity of physical

infrastructure and lab-facilities, ineffective linkage with industry and lack of practical application. Thus, the study accepts the hypothesis.

### 4.8.2 Gender Wise Total Outturn of Engineering Graduates in Kerala.

By supply or outturn of engineering graduates we mean passed out students. In this classification, it is inferred that male graduates were more in the passed out category than female students. Table 4.10 gives a detailed description of the gender wise outturn of students.

**Table 4.10**
**Gender wise Total Outturn of Engineering Graduates in Kerala**

| Year | Boys (%) | Girls (%) |
|---|---|---|
| 2000 | 65.8 | 25.6 |
| 2001 | 61.8 | 38.2 |
| 2002 | 60.3 | 31.7 |
| 2003 | 64.3 | 35.7 |
| 2004 | 56.6 | 43.4 |
| 2005 | 55.4 | 44.6 |
| 2006 | 62.1 | 37.9 |
| 2007 | 63.2 | 36.8 |
| 2008 | 54.5 | 45.5 |
| 2009 | 58.1 | 41.9 |
| 2010 | 58.9 | 41.1 |
| 2011 | 53.5 | 46.5 |
| 2012 | 60.3 | 39.7 |
| 2013 | 64.2 | 35.8 |
| 2014 | 61.6 | 37.4 |
| 2015 | 57.7 | 36.11 |
| 2016 | 55.9 | 34.02 |

Source: NTMIS nodal Centre for Kerala (Various Issues), unpublished data on Universities of Kerala, Kannur, Cochin University, MG University and Calicut University

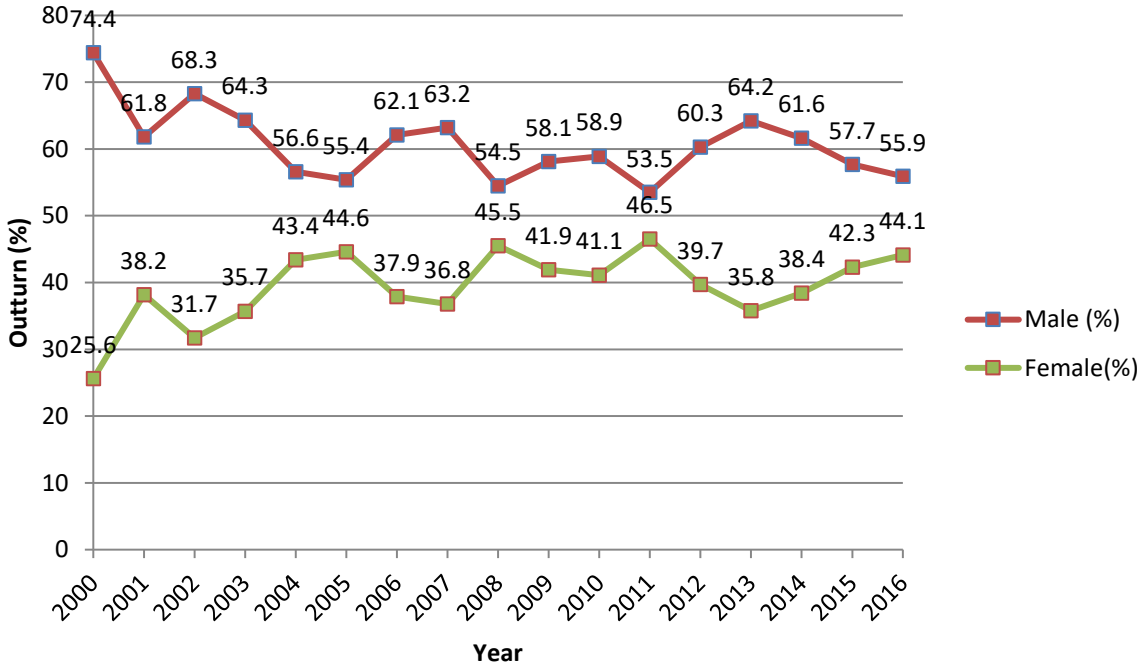
Table 4.10 explains that outturn rates (passed out students) have significantly come down. A branch-wise analysis shows that there has been a considerable reduction in the rate of outturn in the so called popular branches. It is evident that the expansion in capacity of undergraduate education has not led to improvement in output. Kerala has one of the largest numbers of seats for undergraduate courses in engineering, especially compared to its population.

### 4.8.3 Trends in Gender Wise Total Outturn of Engineering Graduates

Figure 4.9 exposes the trend of the gender wise outturn of the students enrolled for engineering graduation. It is noticed that in the year 2000, male outturn rates was high but for female students it was lower as compared to the other years of the study under consideration (2000-2016).

**Figure 4.9**

**Trend in Gender Wise Outturn of Engineering Graduates in Kerala.**




Source: NTMIS nodal Centre for Kerala (Various Issues), unpublished data on Universities of Kerala, Kannur, Cochin University, MG University and Calicut University

Despite sharp increases in outturn since 2004, it was seen that the outturn had been on a declining mode since 2006. There had been a drop in outturn rates in all the 19 branches in 2013 compared to 2001. It is clear that there was an inconsistent pattern in outturn rates of engineering graduates in Kerala. Approaching to gender wise classification, male outturn rates were higher than female engineering graduates. However, female engineering graduates' growth rate is higher than male graduates because of various reasons. It is observed that male students after getting admission in engineering streams, engage themselves in other extra activities. While, female students give priority to their studies and their pass out rate was increasing. Most of the female students

concentrate on studies. Because of these reasons the pass out rates among the female students were increasing year by year consistently.

### 4.8.4 Total Branch wise Outturn of Engineering Graduates in Kerala (2000-2016)

The out turn rates of branch wise engineering degree course display a decreasing trend. These rates measure the actual supply of engineers. The outturn rates from various branches were diminishing compared to intakes rates. At this juncture, here we get the clear picture of 16 years of outturn rate year wise in appendix VII. This table gives a clear idea that electronics and communication, computer science, Electrical and electronics ,mechanical engineering branches had the main outturn rates from 2000 to 2016. There are some branches which were newly introduced and the outturn of these branches were slightly increasing. Mechatronics Engineering, Metallurgy and Naval Architecture and Ship Building were the newly introduced branches in Kerala state. The drop-outs, or failures in exam were causing low outturn rates. This severely affects the actual supply of engineers. Social cost is another cause of such large failures.

To conclude the section on outturn rates, it was observed that the outturn rates had been decreasing compared to the intake. The newly emerged branches such as Mechatronics Engineering, Metallurgy and Naval Architecture and Ship Building had better pass out rates. The dropout rates and failures in exam contributed to the low rate of outturn rates. Social cost of the low rate of pass out students is a burden to the society.

## 4.9 Activity Status of the Graduate Engineers in Kerala (2000-2015)

The activity of the engineers comprises of various forms. The present section (4.8) attempts to observe the activity status of the engineering graduates in Kerala from 2000-2015. At the same time, the trend reveals a declining rate of employment and increasing rate of unemployment in the year 2015. The outturn of engineers at the graduate level in Kerala after the year 2000 witnessed tremendous growth with the inception of new engineering colleges.

## Table 4.11

## Activity Status of the Graduate Engineers in Kerala (2000-2015)

| Year | Activity status of the Engineers (%) | | | | | |
|---|---|---|---|---|---|---|
| | **Employed** | **Self employed** | **Apprentice Trainee** | **Higher Studies** | **Unemployed** | **Others** |
| 2000 | 66.9 | 0.9 | 4.2 | 10.9 | 14 | 2.8 |
| 2001 | 60.1 | 2.2 | 4.3 | 15.3 | 16.2 | 1.5 |
| 2002 | 61.4 | 1 | 5 | 12.5 | 18 | 1.6 |
| 2003 | 65.7 | 0.8 | 3.6 | 12.4 | 16.4 | 0.9 |
| 2004 | 66.21 | 0.53 | 3.88 | 17.01 | 11.2 | 0.99 |
| 2005 | 72.4 | 0.5 | 2.7 | 14.4 | 8.8 | 0.7 |
| 2006 | 64.6 | 0.8 | 3.1 | 20.3 | 10.9 | 0.3 |
| 2007 | 75.9 | 0.2 | 1.8 | 14.5 | 7.1 | 0.2 |
| 2008 | 53.5 | 0.06 | 1.45 | 13.82 | 30.5 | 0 |
| 2009 | 61.24 | 0.81 | 2.61 | 15.41 | 32.61 | 0.31 |
| 2010 | 71.16 | 0.62 | 2.74 | 16.32 | 34.57 | 0.42 |
| 2011 | 64.78 | 0.54 | 3.56 | 12.4 | 37.14 | 0.33 |
| 2012 | 57.62 | 0.72 | 4.52 | 13.71 | 32.18 | 0.26 |
| 2013 | 65.13 | 0.83 | 6.13 | 14.53 | 21.24 | 0.32 |
| 2014 | 61.67 | 1.41 | 5.42 | 14.78 | 24.56 | 0.41 |
| 2015 | 56.12 | 2 | 3.88 | 15.21 | 30.12 | 0.99 |
| **Average** | **64.02** | **0.87** | **3.68** | **14.59** | **21.59** | **0.75** |

Source: Annual Technical Manpower Review Reports 2000-2008, NODAL Centre, Kerala. Economic Review (2000-2016).

Table 4.11 makes clear that the educated unemployment is consistently growing, rate of employment is decreasing, apprentice training is low and self-employment is slightly increasing.The average employment rate is 64.02 per cent whereas the unemployment rate is only 21.59 per cent. The trend of the activity status revealed that employment rate is decreasing and the unemployment rate of engineering graduates were rising. The activity status of the engineers displayed that the engineers were paid high thereby driving many to prefer the engineering streams. This element is further

corroborated with the engineers joining for higher studies and the unemployment rate should naturally have been low among the graduate engineers.

In Kerala the engineering education witnessed significant changes only after 2001 with the opening of new engineering colleges, particularly at the graduate level. The engineering graduates unlike the diploma engineers are found more on paid job but a marginal number of students are still self-employed. The other category of employment is either in the status of a contract job or apprenticeship trainee and all the rest are unemployed or temporarily unemployed or looking for employment.

Rising demand for professional education by the students and the community of parents attracted many of the covetous profiteers in the field of education in the self-financing institutions. The government also promoted the development of these organizations at the higher education sector even if the situation did not demand any expansion of such institutions, anticipating that a part of the professionals coming from these institutions will cater to the global demand without producing high pressure on the labour market in the domestic economy.

## 4.10 Reasons for the Decline in Outturn Rates of Engineering Graduates

The reasons observed during the study for the low outturn rates of engineers are listed out in the following sections.

### 4.10.1 Paucity of Qualified Faculty

The shortage of qualified faculty is the most serious problem confronting Indian Engineering Education System. There are ample job opportunities for engineering graduates possessing higher degrees, in academic institutions. Currently, based on the established All India Council for Technical Education (hereafterAICTE) norms of student: teacher ratio (1:15) and the cadre ratio of 1:2:6 for Professors: Readers: Lecturers the total shortage of teaching staff is over 40,000 and the shortage in the different cadres as Professors-4531, Readers-9063 and Lecturers – 27187. (AICTE REPORT,2006). The number of technical institutions in Kerala, imparting education and research skills in engineering and technology have grown. Most of the technical education institutions including the popular ones are understaffed and lack in qualified, competent and suitable faculty members.

### 4.10.2 Low Aptitude and Capability of the Students

The problem with the entrance examination is that students may obtain a high rank in it even after scoring very low marks (sometimes even negative) in Mathematics. Students with very little mathematical capability are able to get into engineering, which can also affect their subsequent performance. The common entrance exam was created to allocate seats to students applying for graduate level technical education. It is also expected to be a filter, which will select students with aptitude and capabilities for technical education. Apart from the result of common entrance exams, there is also a requirement of certain minimum marks for the qualifying education for admission to colleges. While these mechanisms are expected to ensure that only candidates with an aptitude for engineering gained admission to technical education institutions, in the liberalized regime and the filters began to show their weaknesses.

Candidates who score minimum 10 marks in the entrance examination would be eligible for admission to engineering college. New self-financing institutions have made the selection process even worse. They allow students who can afford the fees to join engineering courses even if their rank is very low. The minimum mark for the qualifying exam became the only important criterion to ensure that students with the right ability for technical education are selected. Unfortunately, this requirement is set at such a low base, that many who do not have the required basic knowledge also enroll for technical education. Conflict between the managements of these institutions and the government led to a situation in which different sets of criteria are used for selection by different institutions every year. Some even conduct their own entrance tests. In short, there is no good mechanism to ensure that only meritorious candidates gain admission for technical education. The rapid growth of engineering institutions not only has led to surplus number of engineering graduates, but also a dramatic shortage in qualified faculty.

### 4.10.3 Absence of Quality Syllabus

Absence of quality syllabus is an important cause for the decline in the outturn rates of the engineering graduates. Rigid and outdated syllabus created low pass outs in engineering education. The syllabus is not updated regularly. There is lack of proper planning, appropriate guidelines, and corrective measures while sanctioning new institutions and disciplines. Thus a large number of institutions are being established taking only profit into consideration and with little emphasis on quality of education.

Studying technical courses in this era is very challenging as technology is advancing at a very rapid rate. If modernization of courses is not applied at the initial stages of graduation, post course completion, engineers will be playing catch-up with the industry rather than shaping it.

### 4.10.4 Low Interest of Students

Most of the students are doing their engineering graduation not out of their interest or choice but to fulfill the aspirations of their patents. So they do not have much interest in engineering graduation. This led to decline in the outturn rates in terms of pass outs.

### 4.10.5 Low Quality of the Lectures Delivered

The quality of the lectures given are below average in engineering education. After the mushrooming growth of engineering institutions, qualities of teachers were very low and it led to a decrease in the value of teaching in engineering graduation.

### 4.10.6 Inadequate Physical Infrastructure

Inadequate space, lighting, ventilation, and sanitation as well as the use of toxic construction materials in schools pose health risks for students and teachers and reduce the quality of the environment in which education occurs, which in turn increases the likelihood of the absence of students or disenrollment.

### 4.10.7 Ineffective Linkage with Industry.

Very rarely do we see students taking up internships in companies during their education term, be it in their vacations also. It is only after being in an industry, can one understand the basics of its functioning. Industry exposure systems a dynamic part of graduate studies and the current system does not provide satisfactory interfaces with the industry. Hence, this has to be instilled into the students especially by the professors as that will provide them a very good understanding about the importance and deliverables of an Industrial Internship.

### 4.10.8 Poor Learner Quality

Mushrooming of low-quality engineering colleges is the root cause of the problems in the engineering education. As students from such colleges fail to get suitable jobs, they face decline in enrolment. Most of the students and their parents choose engineering as

their relatives or neighbors have suggested, and out of the interest to learn the technology. The students joining engineering colleges from rural background, lack communication skills as they have completed schooling with the languages of the state concerned. The students' expectation in education became marks oriented so that, quality and skills are not up to current real life situations.

### 4.10.9 Lack of Practical Application:

Despite having exceptional theoretical knowledge, fresh graduates are lacking the field of practical application of the engineering knowledge, hence, will take a longer time to adapt to the industry. With this being the scenario, even prodigies can actually do very little in an industry unless they are trained and groomed, resulting in the company investing a great deal on them. Not every company has the time, or resources and that is an expense not every employer wants to bear.

### 4.10.10 Existing Trend in Teaching

Traditional teaching method is followed by most of the teachers using brick and mortar teaching which is outdated. With availability of online facilities, these days, using black board and chalk method of teaching became obsolete and the students are not interested in being passive, listeners for the whole hour. When the materials are available online, the students no more need to take notes in the class.

## 4.11 Present Status of Engineering Graduates in Kerala

The technical education scenario in Kerala has undergone phenomenal changes in recent years due to the sanctioning of self-financing colleges in the private sector since 2000. The emissions in the number of engineering colleges and availability of seats have created a situation which altered the sanctity of the professional education system in the state. The selection of students to engineering courses should be based on their engineering aptitude. The education system should be changed from route learning to one based on projects (TimesofIndia,2017). Recently, engineers have become more specialized in their work, education and the modern engineering curricula have not produced graduates with well-rounded skill sets, therefore a good amount of assignments in humanities and social sciences are recommended here, besides technical skills. Engineers are essential to connect the business world with the scientific community and innovation.

In the year of 2017, many of the engineering colleges have applied for closure. In private engineering colleges, the level of education is not up to the required standard. Engineers without any quality are useless to the society.

Since 2016, the number of engineering seats has been on the decline, it is around 75,000 annually. In 2016-17, total intake capacity at undergraduate level was 15, 71,220, of which total enrolment was 7,87,127, which is just around 50.1 per cent. In 2015-16, total intake was 16, 47, 155, of which enrolment was 8, 60,357, which was 52.2 per cent (AICTE report, 2018) . Technical education enables the young generation to contribute to the sustainable development and improvements of quality of life of the society. In 2017, 122 private engineering colleges in the country have opted for progressive closure. It was reported that over eight lakh Engineering seats had remained vacant in 2014-15. Studies have reported that over 80 percent of engineering graduates in the country are not deemed as employable. It is also reported that the majority of engineering graduates are seeking employment that are not related to engineering and having only lower prospects, the blame has to be put on the mushrooming of private engineering colleges. In Kerala, 25470 engineering seats were vacant in 2017-18, as is evident from data obtained from APJ Abdul Kalam Technological University. Hence, no new college and courses in existing colleges may be allowed to start in 2018-19. Immediate steps may be taken to improve the quality of education offered by each institution. Many colleges that lack proper infrastructure and report less than 30 per cent admissions for five consecutive years will have to shut down (AICTE report, 2018).

## 4.12 Quality of Education in Engineering Colleges

The academic quality of government engineering colleges is high and substantial and this was due to the high pass percentage and rising placement of students in reputed companies. The placement record of the students in various government institutions is also relatively high. Many Students get the benefit of experience and inputs from visiting faculty. A number of students are also being qualified for higher studies through competitive examinations like GATE, CAT etc. Most of the students get placement in multinational firms like WIPRO, MAHENDRA, TCS, and BOSCH etc. But, some of the private self-financing colleges do not have good infrastructure and quality of education to produce engineering graduates. Some of them are closed down because of inappropriate infrastructure and low qualified faculty members. Nowadays, majority of engineering

graduates are doing their occupation that are not related to engineering education and having only lower prospects, the blame has to be put on the expanding of private engineering colleges.

## 4.13 Summary

The chapter has summarized the trend and pattern of the supply of engineering graduates in Kerala. The secondary data collected for the analysis was from the period 2000 to 2016. The year 2000 and the preceding years marked a remarkable growth in the number of engineering institutions and a gigantic boost in the IT sector of Kerala. This made the researcher to consider the period from the year 2000 to 2016, to estimate the trend and pattern of the supply of engineering graduates in Kerala. The analysis of the secondary data brought out the finding that there was a mushrooming growth of the self-financing engineering institutions in Kerala. This happened due to the entry of the commercial and profit making institutions and individuals into the engineering education and the quality of the enrolled students were compromised. The intake of male students was proportionately more than female students. Linear Regression was used to find out the relationship between the dependent variable years (2000-2016) and the independent variables outturn and intake respectively. The high R values (0.924 and 0.903) explained a strong relationship between the variables. The overall trend was non-linear due to the high fluctuations in the intake and outturn. The rate of outturn was low compared to the intake of students due to the low percentage of pass outs and the dropouts in engineering graduation.

The newly emerged and highly attractive branches such as Mechatronics Engineering, Metallurgy, and Naval Architecture and Ship Building had better pass percentage than other branches of engineering. The reasons for the decline as observed by the study were (a) Paucity of Qualified Faculty (b) Low Aptitude and Capability of the Students (c) Absence of Quality Syllabus (d) Low Interest of Students (e) Low Quality of Lectures Delivered (f) Inadequate Physical Infrastructure (g) Ineffective Linkage with Industry (h) Poor Learner Quality and (i) Lack of Practical Application.

## 5.1 Introduction

Having analyzed the trend and pattern of engineering graduates in the previous chapter, the employment of engineering graduates is dealt with in the present chapter. The employment and employability are the two areas explained in the chapter. Employment opportunities and employability are much valued terms as far as Kerala is concerned. The creation of job opportunities is a real botheration among the educated persons who are unable to impart their skill and knowledge which they have developed for affecting qualitative fluctuations in the economy and society (Economic Review, 2017). Before we proceed to analyse various aspects of employment, it is apt to outline the profile of the two districts selected for our study.

## 5.2 Profile of the Study Area

As mentioned in the section 1.8.2, we selected two districts for the study i.e. Ernakulam and Thiruvananthapuram. Firstly, we shall discuss about the district of Ernakulam.

### 5.2.1 Ernakulam District

Ernakulam district is situated in the middle of Kerala State and on the coast of the Arabian Sea. The area of the district is 3068 square kilometers. The district is bounded on the west by Lakshadweep Sea, south by Kottayam and Alappuzha districts, east by Idukki district and on the North by Thrissur district. Ernakulam district came into existence on 1$^{st}$April 1958. This district is also called the hub of industrialization in Kerala. It is one of the coastal districts of Kerala (District Census Handbook, 2011).

The third most populous district of Kerala is Ernakulam and its population is 32.8 lakh. Total geographical area of Ernakulam district is 3063 km$^2$ and it is the fourth biggest district by area in the state. Density of population in the district is 1072 persons per km$^2$. There are seven sub districts in the district, among them Kanayannur is the most populous sub district with population of about 8.5 lakh and Kothamangalam is the least populous sub district with population of about 2.4 lakh.

### 5.2.1.1 Map of the District of Ernakulam

**Table : 5.1**

**Ernakulam District: A Statistical Profile**

| **Features** | **Kerala** | **Ernakulam** |
|---|---|---|
| Area(in sq. km) | 38852 | 3068 |
| Population | 33406061 | 3282388 |
| Sex ratio(in 000) | 1084 | 1027 |
| Population density(in sq. km) | 860 | 1072 |
| Literacy(in per cent)<br>Male<br>Female | 94<br>96.11<br>92.07 | 95.89<br>97.36<br>94.46 |

Source: District Census Handbook 2011 Ernakulam

**Education**

Education plays an important role in Kerala in the realm of literacy and educational standards. Ernakulam district is the first district in India to have achieved 100 per cent literacy rate by 1990 (Economic Review 2016). There are three prominent universities in this district – Sanskrit University, Kalady, Cochin University of Science and Technology (CUSAT), Kalamassery, Kerala University of Fisheries and Ocean Studies, Kochi. Ernakulam district has the greatest number of educational institutions in the state.

**Engineering Colleges in Ernakulam**

Majority of the engineering colleges (33) are concentrated in Ernakulam district. There are 32 unaided engineering colleges and one aided college functioning in Ernakulam district and there is no government engineering college in this district (Economic review 2017).Among these, six engineering colleges and more specifically the graduates from these colleges are selected as sample of the study. They are Matha College of Engineering and Technology (North Paravur), Federal Institute of Science and Technology, Albertian Institute of Science and Technology, Mar Athanasious College of Engineering (Kothamangalam), SreeNarayanaGurukulam College of Engineering, and School of Engineering Cochin University of Science and Technology (CUSAT). The students in the district of Ernakulam mostly prefer engineering as a career. Engineering is the application of practical knowledge in order to discover or innovate anything. To get admission in better engineering colleges, students of Ernakulam are required to pass the

engineering entrance exam such as JEE Mains and JEE advance. Some of the engineering institutions are conducting their own entrance exam for engineering entrance. Many engineering institutes in Ernakulam have got good reviews from the students.Students were selecting their branches purely on the basis of their passion, interest, and skill level.

### 5.2.2 The District of Thiruvananthapuram

Thiruvananthapuram District is the southernmost district of the state of Kerala. It was formed on 1st July 1949. The headquarters is the city of Thiruvananthapuram(Trivandrum) which is also the capital city of Kerala. Thiruvananthapuram district is the second most populated district in the state (District Census Handbook, 2011). Thiruvananthapuram District is sharing border with Kollam District to the North, Kanyakumari District to the south, and Tirunelveli District to the East. It is also sharing Border with Tamil Nadu State towards the North. Trivandrum was the previous name of this district. The district lies in the southern part of the state. The geographical location of the district is between $8^0$ 17'' and $8^0$ 54'' north latitudes and between $76^0$ 41'' and $77^0$ 17'' east longitudes.

### 5.2.2.1 Map of the District of Thiruvananthapuram

**Table : 5.2**
**Thiruvananthapuram District: A Statistical Profile**

| Features | Kerala | Thiruvananthapuram |
|---|---|---|
| Area(in sq. km) | 38852 | 2189 |
| Population | 33406061 | 3301427 |
| Sex ratio(in 000) | 1084 | 1087 |
| Population density(in sq. km) | 860 | 1508 |
| Literacy(in per cent)<br>Male<br>Female | 94<br>96.11<br>92.07 | 93.02<br>95.06<br>91.17 |

Source: District Census Handbook 2011 Thiruvananthapuram.

**Education**

Thiruvananthapuram district is a major academic hub. The University of Keralais in Thiruvananthapuram city. There are 20 arts and sciences colleges in the district, and the strength of students is estimated to be 15,926. The University of Kerala has its research and higher-education centers at Kariavattom. The literacy rate of the district is 92.66 per cent. Rural literacy rate was 91.98 per cent and urban literacy rate is 93.24 per cent (Census report, 2011).

**Engineering Colleges in Thiruvananthapuram**

The second largestnumbers of the unaided engineering colleges were functioning in Thiruvananthapuram district (Economic Review, 2018). There are 28 engineering colleges active in the district of Thiruvananthapuram.The district has 26 unaided colleges and two government colleges. There is no aided engineering college in the district (Economic Review, 2017). Six engineering colleges have been selected for the study. They are Government Engineering College (Barton Hill), Mohandas College of Engineering and Technology, University College of Engineering and Technology, College of Engineering Thiruvananthapuram, Marian College of Engineering, and MG College of Engineering. In Thiruvananthapuram district, engineering colleges provide lab facilities, class room facilities and good faculties in the campus. Technical body is there to recognize each and every course of the college so that students are at ease to take decisionsof their own.

## 5.3 Demographic Profile of the Engineering Graduates.

With the help of information about the gender, age, religion, marital status and selected branch wise of the respondents, an effort is being made to show the characteristics of the sample selected in the present study.

### 5.3.1 Gender

The total respondents of the present study consist of 340 (68 %) male and 160 (32 per cent) female. Among the total sample, the selected district wise classification is clearly specified here.InErnakulum district, 158 (31.6%) are men and 92 (18.4 per cent) are women. In the district of Thiruvanathapuram, 182 (36.4%) are men and 68 (13.6 %) in the district of Thiruvananthapuram. The sample which is illustrated as a whole reveals that male ratio is higher than that of female. It is clearly represented in the table 5.3:

**Table 5.3**

**Gender Wise Classification of the Sample Respondents.**

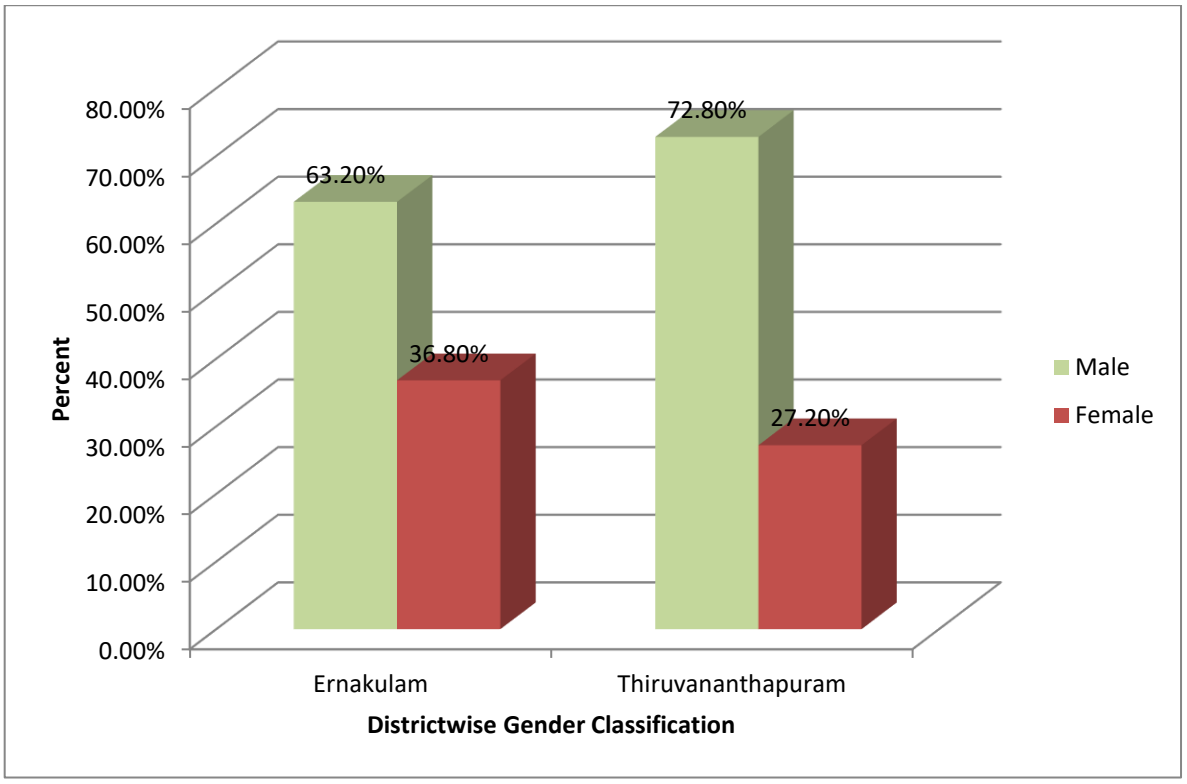
| Category | Ernakulam | Thiruvananthapuram | Total |
|---|---|---|---|
| Male | 158<br>(63.2) | 182<br>(72.8) | 340<br>(68) |
| Female | 92<br>(36.8) | 68<br>(27.2) | 160<br>(32) |
| Total | 250<br>(100) | 250<br>(100) | 500<br>(100) |

Source: Survey Data (Figures in brackets show parentheses)

As per table 5.3, it is clear that out of 500 respondents, the male respondents from the Ernakulam district were 158 (63.2%) and female respondents were 92 (36.8 %). One of the important points to be noticed from the table is that, out of the 500 respondents, male persons are higher in Thiruvananthapuram district which is 182 (72.8 %) than Ernakulam district. In the case of Thiruvananthapuram, 68 (27.2%) were female respondents and it was lower than Ernakulam district. From the study we noticed that many male respondents had taken engineering as a degree than other districts. Graphical presentation is illustrated in Figure 5.1.

**Figure 5.1**

**Gender Classification (%)**




Source: Survey Data

## 5.3.2 Age Category

Age is an important factor to get employed. The age of the person is revelatory of the relative position in job. A person's dynamic involvement and contribution in the activities of any institution depends mainly on their age. The more active a person is, the higher the possibility of his or her involvement in different institutions. There are 14.8 per cent respondents who belonged to the younger age-group of below 25 years in the two districts, 69 per cent belonged to 25-30 years, 15.6per cent are in the age-group of 30-35years, and 0.6 per cent respondents belonged to the above 35 years category. Highest proportion of engineers cluster around the age group between 25 to 30 years.

The samples selected from the two districts of the study as per the gender classification is explained in table 5.4.

**Table 5.4**

**Age composition of Engineers**

| Age Category | Ernakulum | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| 20-25 | 18 (7.2) | 35 (14) | 13 (5.2) | 8 (3.2) | 74 (14.8) |
| 25-30 | 110 (44) | 54 (21.6) | 127 (50.8) | 54 (21.6) | 345 (69) |
| 30-35 | 29 (11.6) | 3 (1.2) | 40 (16) | 6 (2.4) | 78 (15.6) |
| Above 35 | 1 (0.4) | 0 (0) | 2 (0.8) | 0 (0) | 3 (0.6) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Considering the age composition of engineering graduates as shown in table 5.4 reveals that there occurred differences in age composition of engineers. In Ernakulam district, 65.6 per cent of the engineering graduates were at the age composition ranging between 25-30 and 12.8 percent were in 30-35 age category. At the same time in Thiruvananthapuram district, 72.4 per cent of the respondents were in 25-30 age group and 18.4 percent were in 30-35 range. In above 35 age category, the age composition of engineering graduates was at a very low rate in both districts. It is observed that though there were age variations among the respondents, all the age groups participated in the primary survey with great enthusiasm and energy. The study observed that among the sample respondents, the mean age is 27 in Ernakulam and Thiruvananthapuram district and the standard deviation of age is 2.529.

### 5.3.3 Religion

The engineering graduates of Kerala are distributed in all the three major religions of the state, such as Hinduism, Islam and Christianity. Of the entire respondents, male respondents in Hindus, Muslims and Christians were found 68 per cent and female were 32 per cent. Analyzing the religious arrangement of engineering graduates as shown in table 4.2 it can be understood that there was differences in age composition of engineers.

**Table 5.5**

**Categorization of Religion**

| Religion | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Hindu | 81 (32.4) | 63 (25.2) | 131 (52.4) | 45 (18) | 320 (64) |
| Muslim | 18 (7.2) | 3 (1.2) | 22 (8.8) | 3 (1.2) | 46 (9.2) |
| Christian | 59 (23.6) | 26 (10.4) | 29 (11.6) | 20 (8) | 134 (26.8) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

The survey reveals that out of the total sample, 320 (64 %) belongs to the Hindu community. Whereas 46 (9.2%), and 134 (26.8 %) respondents were from Muslim and Christian communities respectively. The table vividly explains that major respondents were Hindus (64%) in both districts. One of the important points to be noticed from the table is that, the share of female Muslim respondents were just 3 (1.2 %) in both districts. Hindus were more in Thiruvananthapuram District and Christians constitute a major community in the district of Ernakulam.

### 5.3.4 Marital Status

Out of the total respondents 202 (40.4 %) were married, while 298 (59.6 %) were unmarried. In the district of Thiruvananthapuram, 44.8 per cent were married and 55.2 per cent were unmarried. The marital status of the respondents is depicted in table 5.6.

**Table 5.6**
**Marital Status**

| Marital Status | Ernakulum | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Married | 44 (17.6) | 46 (18.4) | 72 (28.8) | 40 (16) | 202 (40.4) |
| Unmarried | 114 (45.6) | 46 (18.4) | 110 (44) | 28 (11.2) | 298 (59.6) |

| | | | | | |
|---|---|---|---|---|---|
| Total | 158<br>(63.2) | 92<br>(36.8) | 182<br>(72.8) | 68<br>(27.2) | 500<br>(100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.6 elucidates that majority of the respondents 298 (59.6%) were unmarried. It is made clear from table 5.6 that taking the district of Ernakulam alone the married men were 17.6 per cent and married women were 18.4 per cent. Unmarried men were 45.6 per cent and unmarried women were 18.4 per cent. Analyzing the marital status of the district Thiruvananthapuram, 28.8 per cent men were married and 16 per cent female were married.

### 5.3.5 Course Selected After SSLC

The study found out that out of sample 97.8 per cent had completed plus two after SSLC. 1.6 percent had completed diploma after SSLC and 0.6 percent had done industrial training after SSLC.

**Table 5.7**
**Course Selected After SSLC**

| Courses | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Plus Two | 152<br>(60.8) | 90<br>(36) | 179<br>(71.6) | 68<br>(27.2) | 489<br>(97.8) |
| Diploma | 4<br>(1.6) | 2<br>(0.8) | 2<br>(0.8) | 0<br>(0) | 8<br>(1.6) |
| Others | 2<br>(0.8) | 0<br>(0) | 1<br>(0.4) | 0<br>(0) | 3<br>(0.6) |
| Total | 158<br>(63.2) | 92<br>(36.8) | 182<br>(72.8) | 68<br>(27.2) | 500<br>(100) |

Source: Survey Data (Figures in brackets show parentheses)

Taking cue from table 5.7, it can be stated that from the district of Thiruvananthapuram 98.8 per cent completed plus two after SSLC slightly higher than the respondents of the district of Ernakulam (96.8 %) district. A negligible per cent completed ITC, Diploma and other courses after S.S.L.C, before appearing for engineering degree. It is observed that majority of the respondents preferred plus two after SSLC. A very low per cent (0.6) had done the other courses after SSLC like ITC and ITI courses. It shows that most of the respondents gave priority to plus two course because it helped to them have good educational background for long run and provided more opportunities for varieties of courses.

### 5.3.6 Entrance Examinations

Varieties of Entrance Examinations are conducted for the engineering graduation courses. In Kerala, the common entrance exam is conducted by the Office of the Commissioner of Entrance Exams run by the Government of Kerala. Since 2016, the score of Kerala Engineering Architecture Medical (KEAM) is used for admission to engineering courses.

**Table 5.8**

**Attendance of Entrance Exam**

| Number of Entrance Attended | Ernakulum | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| One time | 146 (58.4) | 82 (32.8) | 178 (71.2) | 66 (26.4) | 472 (94.4) |
| Two time | 12 (4.8) | 10 (4) | 4 (1.6) | 2 (0.8) | 28 (5.6) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.8 shows that 472 (94.4%) of the respondents wrote the entrance exam once to join the engineering graduation and 28 (5.6 %) of the respondents attempted the entrance exam twice to join the engineering stream.

### 5.3.7 Admission Details of Engineering Graduation

Admission details of the respondents are relevant. The present study,clearly depicts that the engineering graduates sought admission through open merit, management, NRI quota and other (Reservation to different communities, Transgenders, Physically challenged, etc.) categories. Out of the total 500 respondents, majority, 279 (55.8%)got admission in management category. Whereas 204 (40.8 %) belonged to the open merit category. One of the interesting points to be noticed from table 5.7 is that the reservation category was just 1.6 per cent only. Admission through management seats dominates the entire admission process.

**Table 5.9**

**Admission Details of Engineering Graduation**

| Admission Details | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Open Merit | 54 (21.6) | 34 (13.6) | 90 (36) | 26 (10.4) | 204 (40.8) |
| Management | 112 (44.8) | 57 (22.8) | 75 (30) | 35 (14) | 279 (55.8) |
| NRI | 5 (2) | 2 (0.8) | 1 (0.4) | 1 (0.4) | 9 (1.8) |
| Others (Reservation to different communities, Transgenders,Physically challenged) | 3 (1.2) | 1 (0.4) | 2 (0.8) | 2 (0.8) | 8 (1.6) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

As shown in table 5.9, the analysis depicts that in Thiruvananthapuram district, the open merit admission was 116 (46.4 %) and in Ernakulam district it was 88(35.2 %). Management wise admissions were high in Ernakulam 169 (67.6 %) district than Thiruvananthapuram district. It is shown that 110 (44%) of the sample respondents from Thiruvananthapuram district got admission in management quota. At the same time, 7(2.8%) respondents from Ernakulam district got admission through NRI quota and in Thiruvananthapuram district it was only 0.8 per cent.The other category was only 1.6 per cent in both districts. At this juncture, it is noticed that opening of more private engineering colleges, leads to the increase in the management seats. It is also observed that majority of the graduates got their admission through Management Quota.

### 5.3.8 Branch Wise Selection

Five main branches of engineering were selected for the primary survey. They are Electronics and Communication Engineering, Electrical and Electronics Engineering, Civil Engineering, Mechanical Engineering and Computer Science Engineering. The five branches were equally selected from two districts namely

Ernakulum and Thiruvananthapuram. From each district 50 samples were selected from five branches. The branch wise selection of engineering graduates is presented in table 5.10.

**Table 5.10**

**Branch Wise Classification of the Sample Respondents**

| Branches | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| ECE | 21 (8.4) | 29 (11.6) | 29 (11.6) | 21 (8.4) | 100 (20) |
| CE | 29 (11.6) | 21 (8.4) | 31 (12.4) | 19 (7.6) | 100 (20) |
| ME | 50 (20) | 0 (0) | 50 (20) | 0 (0) | 100 (20) |
| EEE | 37 (14.8) | 13 (5.2) | 45 (18) | 5 (2) | 100 (20) |
| CS | 27 (10.8) | 23 (9.2) | 26 (10.4) | 24 (9.6) | 100 (20) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.10 illustrates that each branch had 100 (20 per cent) respondents. Out of total sample respondents, gender classification of each branches was different.One of the important points to be noticed from table 5.8 is that, there are no female respondents from Mechanical branch in the two districts. In Thiruvananthapuram, 10 per cent were from Computer Science and 4.2 per cent were from Electronics and Communication Technology.

### 5.3.9 Type of College for Graduation

In the sample survey three types of colleges were selected. They are government colleges, aided colleges and Private colleges (self-financing colleges). The study found out that mainly 36.8 per cent of the male participants had completed their graduation from government colleges and 7.6 per cent female candidates did their graduation from same colleges in Thiruvananthapuram district. At the same time there were no aided colleges in Thiruvananthapuram district and 36 per cent malehad completed

their graduation from private colleges and 19.6 per cent women had graduated from private colleges. There is no representation from aided colleges in the district of Thiruvananthapuram because there are no aided engineering colleges in the district.

In Ernakulam district, there is no government engineering college and 46.8 per cent of the men had completed their graduation from private colleges and 30.8 per cent women had completed their graduation from same colleges. 16.4 per cent male persons were graduated from aided colleges and 6 per cent women were graduated from aided colleges. This is depicted in table 5.11.

**Table 5.11**
**Type of Colleges for Graduation**

| Type of college | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Govt | 0 (0) | 0 (0) | 92 (36.8) | 19 (7.6) | 111 (22.2) |
| PVT | 117 (46.8) | 72 (30.8) | 92 (36.8) | 49 (19.6) | 330 (66) |
| Aided | 43 (17.2) | 16 (6.4) | 0 (0) | 0 (0) | 59 (11.8) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Out of total sample respondents, 111 (22.2 %) respondents completed their graduation from government colleges and 330 (66%) respondents had done their graduation from private engineering colleges. There were 56 (11.2%) respondents who had done their graduation in aided colleges. The study observed that more placement facilities were provided in the government engineering colleges, but most of the colleges in Kerala are private owned. Hence, majority of the sample respondents were from private self-financing colleges. The present study mainly noticed that more graduates studied in private self –financing colleges in Kerala.They were admitted in Management Quota paying high donation.

### 5.3.9.1 Classification of Engineering Colleges (Branch Wise).

In branch wise classification, five branches were selected for the study and each selected sample district hada specified the branch wise classification of engineering colleges. There are three types of colleges in Kerala i.e. Government, Aided and private self-financing. It is explained in table 5.12.

**Table 5.12**

**Classification of Engineering Colleges(Branch wise in percentages)**

| Type of College | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Govt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2.4 | 8.8 | 3.6 | 12.8 | 0 | 10.4 | 1.2 | 0.8 | 0.4 |
| PVT | 5.2 | 9.6 | 6.8 | 6.4 | 14.8 | 0 | 10.8 | 4.4 | 7.2 | 10.4 | 7.6 | 6 | 3.6 | 4 | 7.2 | 0 | 7.6 | 0.8 | 10 | 0.8 |
| Aided | 3.2 | 2 | 4.8 | 2 | 5.2 | 0 | 2 | 0.8 | 1.2 | 1.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Source: Survey Data

Table 5.12 indicates that, out of total sample respondents, in Ernakulam district majority of them (77.6 %) had done their graduation from private colleges which is higher than Thiruvananthapuram district (55.6%). In branch wise classification, majority of the mechanical engineering male respondents have done their graduation from private colleges from Ernakulam and 12.8 percent of the male respondents from Thiruvananthapuram district have done their graduation from same type of college. The table shows that there is no representation from government engineering college in Ernakulam district and there is no respondent from aided college in Thiruvananthapuram district. The main reason is that, in Ernakulam district there is no government engineering college and in Thiruvananthapuram district, there are no aided colleges.

### 5.3.10 Self-Assessment of Selecting Particular College

Engineering graduates have given ranksfor various reasons to select their college for graduation. The major criteria for selecting college for graduation are campus facility, allotment, reputation of the college, academic quality, placement opportunities and closeness to home. The engineering graduates both in Ernakulam and Thiruvananthapuram districts assigned different rank to campus facilities, allotment,closeness to home, reputation of college, allotment and academic quality. The study observed that few students were critical about their colleges due to low facilities provided to them. The colleges should be known for their infrastructural facilities and academic qualities. The

students have their own expectation fortheir college facilities. The mean rank of the selecting particular college was given in table 5.13.

**Table 5.13**

**Self-Assessment of the Selecting Particular College**

| Ranks | |
|---|---|
| | **Mean Rank** |
| Campus facilities | 1.98 |
| Allotment | 3.28 |
| Reputation of the College | 3.71 |
| Academic Quality | 3.90 |
| Placement Opportunities | 4.02 |
| Closeness to Home | 4.12 |

Source: Survey Data

As an analysis was made on the facilities of the campus the highest mean rank was given. The mean rank of campus facilities is 1.98. Allotment (3.28) has got the next highest rank. Closeness to home (4.12) scored least rank in the analysis. The test statistics of ranking of selecting colleges were given table 5.14.

**Table 5.14**

**Test Statistics**

| | |
|---|---|
| N | 500 |
| Chi-Square | 459.311 |
| Df | 5 |
| Asymp. Sig. | .000 |
| a. Friedman Test | |

Source: Survey Data Analysis

Table 5.14 exposed that Friedman test was used for the assesses the ranking of selecting colleges for graduation. The Chi-square value was 459.31, degrees of freedom was 5 and the significant level was .000. The results shows that there is relationship between reasons for selecting colleges for engineering graduation and ranking.

### 5.3.11 Reasons for selecting Particular Branch

For analyzing the reason for selecting branch a number of reasons were elicited. In district wise analysis and gender wise analysis the students preferred the special branch due to self-interest.Compulsion by parents is one of the reasons for selecting special branches in Ernakulam district. Mainly 1.2 per cent respondents selected a particular branch accidently for their graduation in Ernakulam district. 95.2 per cent from the district of Ernakulam and 93 per cent from Thiruvananthapuram selected their branch of study due to self-interest.

In Thiruvananthapuram district, allotment (3.6 %) was the second reason for selecting branches for graduation. Further 0.4 per cent was given importance to 'accidentally' for the selection of their branch for graduation. It is observed that, sample respondents from allotment category explained that self-interest helped them to select the branches. The private engineering colleges were only interested in money and did not provide facilities to select particular branches to students. Certain branches did not have enough infrastructure. So, the students did not prefer them.

**Table 5.15**

**Reasons for Selecting Branch**

| Reasons for selecting branches | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Self interest | 478 | 95.6 | 95.6 | 95.6 |
| | Allotment | 13 | 2.6 | 2.6 | 98.2 |
| | Compulsion by Parents/Others | 4 | .8 | .8 | 99.0 |
| | Ability | 1 | .2 | .2 | 99.2 |
| | Accidently | 4 | .8 | .8 | 100.0 |
| | Total | 500 | 100.0 | 100.0 | |

Source: Survey Data

Table 5.15 displays that majority of the respondents 478 (95.6 %) selected the branches due to self-interest. 2.6 per cent of the respondents were having allotment basis for selecting their branches. As low as 0.8 per cent were selected their branches out of compulsion.

### 5.3.12 Mark in Engineering Graduation

Out of the total engineering graduates, the highest proportion of mark is found between 60-70 (39.6 per cent in Ernakulam district and 61.2 per cent respondents in Thiruvananthapuram district). Analyzing the district wise graduation marks, it must be noted that Ernakulam district had 0.4 per cent below 50 marks, 9.6 per cent between 50-60 marks and 8.4 per cent respondents were between 70-80 range and noted no respondents had marks above 80 out of hundred. In Thiruvananthapuram district, 0.4 per cent respondents had below50 marks, 5.6 per cent had between 50-60 range, 14.4 per cent had 70-80 range and 2.4 per cent got above 80 out of 100 marks. Table 5.14 explains the marks secured by the engineering graduates.

**Table 5.16**

**Marks Secured**

| Marks | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Below 50 | 1 (0.4) | 0 (0) | 1 (0.4) | 0 (0) | 2 (0.8) |
| 50-60 | 28 (5.6) | 10 (4) | 12 (4.8) | 2 (0.8) | 52 (10.4) |
| 60-70 | 119 (11.2) | 71 (28.4) | 142 (40.8) | 51 (20.4) | 383 (76.6) |
| 70-80 | 10 (4) | 11 (4.4) | 22 (8.8) | 14 (5.6) | 57 (11.4) |
| 80 & Above | 0 (0) | 0 (0) | 5 (2) | 1 (0.4) | 6 (1.2) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

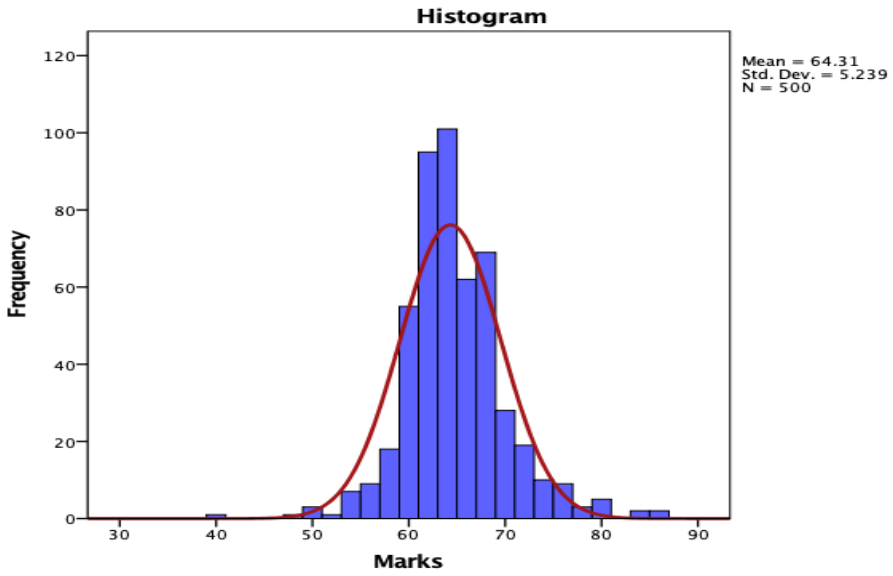
Source: Survey Data (Figures in brackets show parentheses)

The survey reveals that out of the total 500 respondents, 383 (76.6 %) had marks between 60-70.Whereas 57(11.4%), 52 (10.4%), 6 (1.2%) and 2 (0.8%) respondents had 70-80, 50-60, 80 and below 50 respectively. The average mark of engineering

graduates is 64.The standard deviation of mark is 5.239. Graphical presentation is illustrated in Figure 5.2.

**Figure 5.2**

**Total percentage of Mark in Engineering Graduation (%)**




Source: Survey Data

In both districts, it is interesting to note that most of the students had marks between 60-70. The figure 5.2 clearly shows that average mark of engineering graduates is 64.Their standard deviation was 5.239.The minimum mark was 40 and maximum mark was 85.

### 5.3.12.1 Branch Wise Classification of Marks.

It is observed that there are mainly five branches selected for the study by the engineering graduates. The present study observed that 27.2 per cent of the Electrical and Electronic branch male respondents earned 60-70 mark at the same time 17.4 per cent of the Mechanical Engineering branches' male respondent attained 60-70mark range. In female category,16 per cent of the Computer Science Engineering students were earned 60-70 marks and 0.4 per cent of the Electronics and Communication female students got 80 and above marks out of 100.

## Table 5.17

**Branch Wise Classification of the Total Percentage of Mark (%)**

| Marks | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Below 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 | 1.2 | 0 | 1.4 | 0 | 1.4 | 0 | 0 | 0 | 0 | 0 |
| 50-60 | 1.6 | 1.2 | 1.2 | 0.8 | 4 | 0 | 3.2 | 0.4 | 1.2 | 1.6 | 1.2 | 2 | 0.4 | 0 | 1.2 | 0 | 0.4 | 0 | 1.6 | 0.4 |
| 60-70 | 5.6 | 8.8 | 9.2 | 6.4 | 16 | 0 | 11.2 | 4 | 5.2 | 9.2 | 9.6 | 6.8 | 8.4 | 6 | 1.4 | 0 | 16 | 0.8 | 8.4 | 6.8 |
| 70-80 | 1.2 | 1.2 | 1.2 | 1.2 | 0 | 0 | 0.4 | 0.8 | 1.6 | 0.8 | 1.9 | 4.2 | 3.2 | 1.6 | 3.2 | 0 | 0.8 | 0.8 | 2.9 | 3 |
| 80 and Above | 0 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 | 0.8 | 0 | 0.8 | 0 | 0 | 0 |

Source: Survey Data

Table 5.17 indicates that respondents of the Mechanical Engineering Branch were 16 per cent and they had marks ranging between 60-70 in Ernakulam district and it is greater than that of Thiruvananthapuram district. None of the Mechanical Engineering graduates were in 70-80 range in the district of Ernakulam, at the same time 3.2 per cent respondents got 70-80 mark in Thiruvananthapuram district. Only 2.4 per cent got above 80 marks. The present study found that most of the engineering graduates got marks rangingbetween 60-70.

## 5.4 Employment Details

The study had a selection of employed graduates. Employment is an important concern in our study. Employment is a contract between two parties based on a work which is paid and gets satisfaction towards basic needs. Employment contains all individuals of working age who during a specified brief period, such as one week or one day, were in the following categories: a) paid work (whether at work or with a job but not at work); or b) self-employment (whether at work or with an enterprise but not at work). Occupational choice of a person to safeguard a protected and constant life.The study mainly focused on employment issues of engineering graduates like nature, type and conditions of employment that they required. For this reason a selection of employed persons was made.

## Table 5.18
### Employment Details

| Employment Details | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Employed | 158 | 92 | 182 | 68 | 500 |
| Percent | 31.6 | 18.4 | 36.4 | 13.6 | 100 |

Source: Survey Data

Considering district wise analysis, in Thiruvananthapuram district has the highest male respondents (36.4%) employed than Ernakulam district (31.6 %). Female respondents are employed higher in Ernakulam (18.4%) than Thiruvananthapuram district (13.6%).

### 5.4.1 Employment and Institution

Out of the total respondents, 52.6 per cent were working in IT in both the districts. 18.8 per cent of the engineering graduates were working in other institutions. There are 11.6 respondents from construction field, 9.6 per cent from mechanical.Male graduates in both the districts were working in IT field and most of the female graduates from two districts were working in IT sector. This is clearly specified in table 5.19.

**Table: 5.19**

**Percentage wise Institution Details**

| Institutions | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| IT | 40 (16) | 48 (19.2) | 128 (51.2) | 47 (18.8) | 263 (52.6) |
| Bank | 9 (3.6) | 8 (3.2) | 10 (4) | 2 (0.8) | 29 (5.8) |
| College | 1 (0.4) | 2 (0.8) | 4 (1.6) | 2 (0.8) | 9 (1.8) |
| Mechanical Field | 29 (11.6) | 10 (4) | 9 (3.6) | 0 (0) | 48 (9.6) |
| Construction | 25 (10) | 18 (7.2) | 10 (4) | 4 (1.6) | 57 (11.4) |
| Other | 54 | 6 | 21 | 13 | 94 |

| | | | | | |
|---|---|---|---|---|---|
| | (21.6) | (2.4) | (8.4) | (5.2) | (18.8) |
| Total | 158<br>(63.2) | 92<br>(36.8) | 182<br>(72.8) | 68<br>(27.2) | 500<br>(100) |

Source: Survey Data (Figures in brackets show parentheses)

The study observed that the selected sample respondents were working in IT field, teaching profession, mechanical field, banking area and in others fields. The other field includes driving, government jobs, companies (industrial). 24 per cent of the engineering graduates were preferred other category job in Ernakulam district and they did not done their job in their qualification. 13.6 per cent of sample respondents were from Thiruvananthapuram district done their employment in other category.

### 5.4.1.1 Branch wise classification of the Employment Institution details.

Coming to the branch wise analysis, it is noticed that most of the employed person are from IT sector. In these, computer science engineering graduates worked in IT field in Ernakulam and Thiruvananthapuram districts. Other sample respondents from Electrical and Electronics branch of Ernakulam district worked in other categories. In Thiruvananthapuram, it is seen that, Electrical and Electronics Engineering (EEE) branch were more in other categories.12 per cent of the Computer Science engineering branch was working in theirown field.8.8 per cent of the female graduates from Electronics and Communication branch worked in IT section.

## Table 5.20

**Branch Wise Classification of the Employment Institution (%)**

| Institutions | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| IT | 3.6 | 5.6 | 2.4 | 1.6 | 2 | 0 | 4.8 | 3.2 | 4.8 | 7.2 | 6 | 3.2 | 4.8 | 2.4 | 5.6 | 0 | 8 | 1.6 | 7.2 | 4 |
| Bank | 1.2 | 2 | 0.8 | 0.4 | 0 | 0 | 1.6 | 0.4 | 2.8 | 0.8 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 0 | 0.8 | 0 | 0.4 | 0.8 |
| College | 0.8 | 1.6 | 1.2 | 1.6 | 0.8 | 0 | 2 | 0.8 | 1.2 | 1.6 | 1.2 | 1.2 | 2 | 0.8 | 1.2 | 0 | 1.2 | 0.4 | 0.8 | 1.6 |
| Mechanical Field | 2.4 | 0 | 0.8 | 0 | 9.6 | 0 | 0.8 | 0 | 0 | 0 | 0.4 | 0 | 1.2 | 0 | 8.8 | 0 | 1.6 | 0 | 1.2 | 0 |
| Construction | 0 | 0.4 | 3.6 | 4 | 0.8 | 0 | 2.4 | 0 | 0.4 | 0 | 1.2 | 0.8 | 2 | 0.4 | 1.6 | 0 | 2.4 | 0 | 0.8 | 0.8 |
| Other | 1.6 | 2 | 2.8 | 0.8 | 2.4 | 0 | 3.2 | 0.8 | 1.6 | 2.8 | 1.2 | 1.6 | 1.2 | 2 | 1.2 | 0 | 4 | 0 | 0.4 | 2 |

Source: Survey Data

Table 5.20 narrates that majority of the candidates from Mechanical Engineering branch were (9.6 %) working in Mechanical field in Ernakulam district, which is greater than in the district of Thiruvananthapuram (8.8 per cent). While 9.2 per cent from Electronics and Communication branch were working in IT field, and 9.2 per cent Electronics and Communication branches were working in IT field in Thiruvananthapuram district. There are least (0.4 per cent) respondents from Electronics and Communication working in construction field in

Ernakulam district and it was less than in Thiruvananthapuram district (2 per cent) too. One of the important facts noticed was that majority of the Computer Science Engineering female graduates were working in IT field in Ernakulam district than from the district of Thiruvananthapuram.

At this juncture it can be noticed that majority of the graduates were working in areas such as IT field, construction, banking, mechanical, teaching and other related areas. Other employment includes government jobs, business process outsourcing, driving and business. Most of the graduates are not working as engineers and work in other areas. The present study observed that most of the engineering graduates especially from Civil Engineering, Mechanical and Electrical and Electronics engineering students were working in other areas than their specialization. In teaching field,4.8 per cent of the Electronics and Communication Engineering graduates were there and 5.6 per cent of the Civil Engineering students, 2 per cent of the Mechanical Engineering students, 4.4 per cent of the Electrical and Electronics graduates and 5.2 per cent of the Computer Science graduates were working in other areas. In Mechanical field,male respondents are performing well. In construction field, basically Civil Engineering students are more concentrated. It was observed that 3.2 per cent of the Electronics and Communication Engineering graduates, 10 per cent of the Civil Engineering students, 2.4 per cent Mechanical students, 4.8 per cent Electrical and Electronics graduates and 2 per cent of Computer Science graduates worked in other areas than their specialization. In other fields, like BPO(Business Process Outsourcing), government job, clerical job also the engineering graduates have worked. 6.4 per cent of Electronics and Communication students,6.8 per cent of Civil Engineering students, 3.6 per cent Mechanical students, 8 per cent of Electrical and Electronics graduates and 6.8 per cent Computer Science graduates were working in other areas.

### 5.4.2 Nature of the Work of the Engineering Graduates

Comparing Ernakulam district, male respondents with temporary job were higher than female respondents. To find out the nature of work was one of the objectives in the present study. Nature of work means the type of work that he or she does. This can refer to the basic daily tasks carried out as part of a job and can refer to other non-routine tasks that may be required. The level of a person's work, or performance, is often directly connected to the nature, or type of work, assigned to the employee. In both districts,

temporary work was dominant than permanent work. The nature of work is presented intable 5.21.

**Table 5.21**

**Nature of Work**

| Nature of Work | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Temporary | 119 (47.6) | 80 (32) | 134 (53.6) | 62 (24.8) | 395 (79) |
| Permanent | 39 (15.6) | 12 (4.8) | 48 (19.2) | 6 (2.4) | 105 (21) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

It is evident from Table 5.21 that 395 respondents (79 %) have temporary work and majority of them are in Ernakulam (79.6 %) followed by Thiruvananthapuram (78.4 %). Another 105 (21%) of the respondents are engaged in permanentnature of work. However, 54 respondents (21.6 %) are permanent workers in Thiruvananthapuram district followed by Ernakulam (20.4 %).It is noticed that some of the permanent workers were engaged in government sector and banking sector.

### 5.4.2.1 Branch Wise Classification of the Nature of Work

In the nature of work in branch wise classification it is seen that 17.6 per cent from Computer Science branch were temporary workers than ECE and EEE from Ernakulam district. In Thiruvananthapuram, majority of the graduates from Electronics and communication branches were working as temporary employees.

## Table 5.22

### Branch Wise Classification of the Nature of Work (%)

| Nature of Work | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Temporary | 6 | 9.2 | 6.4 | 5.6 | 15.2 | 0 | 10.4 | 4.8 | 7.2 | 10.4 | 8.8 | 7.2 | 6.4 | 4.8 | 15.2 | 0 | 13.2 | 1.6 | 5.6 | 9.2 |
| Permanent | 2.4 | 2.4 | 5.2 | 2.8 | 4.8 | 0 | 4.4 | 0.4 | 0.8 | 1.6 | 2.8 | 0.8 | 6 | 2.8 | 4.4 | 0 | 4.8 | 0.4 | 1.2 | 0 |

Source: Survey Data

Table 5.22 quite obviously shows that 15.2 respondents (63%) from Electronics and Communication branch were working as temporary workers, 15.2 per cent from Mechanical,12 per cent from Civil and the majority of them (17.4 %) from Computer Science are in Ernakulam district. It is also evident from table that 16 per cent respondents from Electronics and Communication, 11.2 per cent from Civil, 15.2 per cent from Mechanical 14.8 per cent from Electrical and Electronics, 14.8 per cent from Computer Science were temporary workers in the district of Thiruvananthapuram. It can be concluded from table 5.19 that majority of the engineering graduates both in the districts of Ernakulam and Thiruvananthapuram were placed as temporary employees. Permanent job is a security for the employed persons. This could also be due to the fact that the nature of permanent vacancies is quite a few in numbers in Kerala.

## 5.4.3 Type of Work

In the present study, type of work means that employees working in different areas like core firm or software firm. Core firm means business or other works which are not related to IT. And a software firm means business units producing equipment in software market. A software institute advances and allocates computer software that may be used for many purposes. The type of work is presented in table 5.23.

## Table 5.23

## Type of Work

| Type of Work | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Software | 109 (43.6) | 34 (13.6) | 102 (40.8) | 19 (7.6) | 264 (52.8) |
| Core | 49 (19.6) | 58 (23.2) | 80 (32) | 49 (19.6) | 236 (47.2) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Out of the total respondents, 52.8 per cent have worked in Software Firm and 47.20 per cent were in Core Firm. 84.4 per cent of the male respondents worked in Software Firm and 51.6 per cent in Core Firm. Female respondents working in software firm were 21.2 per cent which was lower than them employed in core firm which 42.8 per cent. Hence, it is quite evident that core firms absorbed more women for employment than the software firms.

### 5.4.3.1 Branch Wise Classification of the Type of Work.

Branch wise classification explains the type of work the engineering graduates are engaged in. The present study, discloses that most of the engineering graduates were working in software field. This can be explicated in table 5.24.

## Table 5.24

**Branch Wise Classification of the Employment Institution Details (%)**

| Types of Job | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Software | 6 | 9.2 | 6.4 | 5.6 | 15.2 | 0 | 10.4 | 4.8 | 7.2 | 10.4 | 8.8 | 7.2 | 6.4 | 4.8 | 15.2 | 0 | 13.2 | 1.6 | 5.6 | 9.2 |
| Core | 2.4 | 2.4 | 5.2 | 2.8 | 4.8 | 0 | 4.4 | 0.4 | 0.8 | 1.2 | 2.8 | 0.8 | 6 | 2.8 | 4.4 | 0 | 4.8 | 0.4 | 1.2 | 0 |

Source: Survey Data

Table 5.24 shows that out of total sample, 15.2 per cent of the persons from Mechanical Branch were working in softwarefirms and 17.6 per cent from Computer Science Engineering were working in software field. 15.2 per cent respondents from Electronics and Communication, 12 per cent from Civil were working in softwarefirm in Ernakulam district. In Thiruvananthapuram district, 16 per cent from Electronics and Communication, 15.2 per cent from Mechanical, 14.8 per cent from Electrical and Electronics, 14.8 percent from Computer Science were working in softwarefirms respectively.

Eight per cent of the respondents from Civil, 4.8 per cent from Electronics and Communication, 4.8 per cent from Electrical and Electronics, 2 per cent from Computer Science 4.8 per cent from Mechanical were working in Core Firms in the district of Ernakulam. In Thiruvananthapuram, 8.8 per cent from Civil, 3.6per cent from Electronics and Communication,4.4 per cent from Mechanical, 5.2 per cent from Electrical and Electronics, and 1.2 percent from Computer Science were working in Core Firms.

### 5.4.4 Placement through Campus Selection

Discussing about the employment details of respondents it is noted that majority of the engineering graduates were not placed through campus selection. Out of total respondents 418 (83.6 %) were not placed through campus selection and 82 (16.4 %) respondents were placed through campus selection conducted by different companies. This is presented in table 5.25.

**Table: 5.25**

**Placed through Campus Selection**

| Placement Details | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Campus Selection | 15 (6%) | 20 (8%) | 34 (13.6%) | 13 (5.2%) | 82 (16.4%) |
| Not Campus selection | 143 (57.2%) | 72 (28.8%) | 148 (59.2%) | 55 (22%) | 418 (83.6%) |
| **Total** | 158 (63.2%) | 92 (36.8%) | 182 (72.8%) | 68 (27.2%) | 500 (100%) |

Source: Survey Data (Figures in brackets show parentheses)

It is made clear from table 5.25, that in district wise analysis,86 percent of the respondents from the district of Ernakulam are not placed through campus selection and

81 per cent respondents from Thiruvananthapuram were not placed through campus selection. Thiruvananthapuram district was higher in placement through campus selection than the district of Ernakulam. It may be due to the fact that there are two government engineering colleges situated in the district of Thiruvananthapuram and students with good quality have joined the government engineering colleges. The reason for this is that the selection is based purely on merit and not through management quotas and seats.

### 5.4.4.1 Branch Wise Classification of the Placement Details.

In this section 5.3.4.1 a discussion on the details of placement of different branchesof graduates were done. Majority of the engineering graduates were not placed through campus selection. The study found out that most of the campus selection was from Civil Engineering. The second place is secured by the branch of Electronics and Communication Technology.

**Table: 5.26**

**Branch Wise Classification of the Placement Details.**

| Placement Details | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Campus Selection | 0.8 | 5.2 | 6.4 | 1.6 | 1.2 | 0 | 1.2 | 2.4 | 2.4 | 0.4 | 2 | 2 | 2.4 | 1.2 | 2.8 | 0 | 4.4 | 1.2 | 2 | 2 |
| Not Campus selection | 7.6 | 6.4 | 5.2 | 7.2 | 18.8 | 0 | 13.6 | 2.8 | 6 | 10.4 | 9.6 | 6.4 | 10 | 6.4 | 17.2 | 0 | 13.6 | 0.8 | 8.8 | 7.2 |

Source: Survey Data

Table 5.26 makes it clear that out of the total sample,the male graduates from the district of Ernakulam,who studied Mechanical(18.8 %) and Electrical and Electronics Engineering (13.6%) and Computer Science Engineering (10.4%) were not placed through campus selection. One of the important points to be noticed from the table is that, the share of mechanical branch from Thiruvananthapuram is just 17.2 per cent and it was not through campus selection. Majority of the respondents from Thiruvananthapuram have placed through campus selection than Ernakulam district. 5.6 per cent from Electrical and Electronics branches were placed through campus selection. Engineering graduates from the male category placed through campus selection were higher than female in the district of Thiruvananthapuram and it was reverse in the district of Ernakulam.

## 5.4.5 Nature of Management Institution

As the analysis is done on the nature of institutions it canbe noticed that there were mainly three types of institutions. They are government, private and aided institutions. Private or self-financing institutions dominated in number in the engineering education in Kerala. Taking cues from table 5.25, it is clear that 91.6 per cent from the district of Ernakulam and 88.4 per cent from the district of Thiruvananthapuram were private or self-financing institutions.

**Table: 5.27**

**Nature of Management Institutions**

| Nature of Institutions | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Government | 10 (4) | 5 (2) | 19 (7.6) | 5 (2) | 39 (7.8) |
| Aided | 4 (1.6) | 2 (0.8) | 4 (1.6) | 1 (0.4) | 11 (2.2) |
| Private | 144 (57.6) | 85 (34) | 159 (63.6) | 62 (24.8) | 450 (90) |
| **Total** | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.27 states that 90 per cent of the graduates from the engineering stream worked in private institutions.In the district of Ernakulam only six per cent have worked in government institutions.The graduates from the district of Thiruvananthapuram who worked in government institutions were just 9.6 per cent which is more than in the district of Ernakulam.The share of the aided institutionswas only 2.4 per cent in the district of Ernakulam and two per cent in the district of Thiruvananthapuram. Hence the conclusion is drawn that majority of the engineering institutions in Kerala are in private sector.The role of the government in these institutions is only meager.

### 5.4.5.1 Branch Wise Classification of the Nature of Institutions.

The branch wise classification of nature of the institutions in which that the graduates were employed, showed thatinstitutionswere government, private and aided colleges.

**Table 5.28**

**Branch Wise Classification of the Nature of Institutions (%)**

| Nature of Institutions | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Government | 0.4 | 1.2 | 3.2 | 2.4 | 2 | 0 | 1.2 | 0 | 0.8 | 0.8 | 2 | 0 | 1.6 | 0.8 | 0.4 | 0 | 2.4 | 0.8 | 0.8 | 0.4 |
| Aided | 0 | 0.4 | 1.2 | 2.8 | 0.8 | 0 | 0.8 | 0 | 0 | 0 | 0.8 | 0 | 1.2 | 0.4 | 0 | 0 | 0 | 0 | 0.8 | 0 |
| Private | 8 | 10 | 7.2 | 4 | 17.2 | 0 | 12.8 | 4.4 | 7.6 | 10.8 | 8.8 | 8.4 | 9.6 | 6.4 | 19.6 | 0 | 15.6 | 1.2 | 9.2 | 8.8 |

Source: Survey Data

Majority of the respondents (18%) were from Electronics and Communication branches. They worked in the district of Ernakulam and noticed that there wereno respondents from Computer Science branch working in aided institutions. Majority of the respondents (19.6 per cent) from the district of Thiruvananthapuram were working in private institutions and there were no persons from the discipline of Mechanical Engineering working in aided institutions. The persons from Electrical and Electronicsin Thiruvananthapuram were 3.2 per cent and those with Electronics and Communication, Computer Science branches were just 0.8 per cent. Only 0.4 per cent of Electronics and Communication graduates were working in aided institutions in the district of Ernakulam.

## 5.4.6 Details of Salary

Salary is cash that a person accepts in exchange for providing a good or service or through investing funds. Salary is used to measure economic condition of a person. Employment with a regular salary is a decisive factor in the life of an individual as significant as level of pay. Income distribution is extremely important for developmentof persons and society.

**Table 5.29**

**Details of Monthly Salary**

| Income | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Below 10000 | 5 (2) | 7 (2.8) | 4 (1.6) | 3 (1.2) | 19 (3.8) |
| 10000-30000 | 106 (42.4) | 70 (28) | 126 (50.4) | 53 (21.2) | 355 (71) |
| 30000-50000 | 33 (13.2) | 13 (5.2) | 36 (14.4) | 10 (4) | 92 (18.4) |
| 50000-70000 | 10 (4) | 1 (0.4) | 11 (4.4) | 2 (0.8) | 24 (4.8) |
| 70000-90000 | 1 (0.4) | 1 (0.4) | 2 (0.8) | 0 (0) | 4 (0.8) |
| Above 90000 | 3 (1.2) | 0 (0) | 3 (1.2) | 0 (0) | 6 (1.2) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

It is seen that 19 (3.8%) respondents fall under the category of salary below ₹ 10000 categories. Majority of them (4.8%) were from Ernakulam district followed by Thiruvananthapuram district (2.8 %). 355 out of 500 respondents (71 %) had their earning between ₹ 10000 – 30000. While, 92 (18.4 %) have monthly salary between ₹ 30000-50000. Only 24 (4.8 %) and 6 (1.2 %) respondents have monthly salary between ₹ 50000-70000 and above ₹ 90000 respectively. Under salary category of ₹ 70000-90000, the respondents from the two districts were earning equal income, at the same time gender classification from the district of Ernakulam male and female were under this category. No female graduates from the district of Thiruvananthapuram earned a high salary as between ₹ 70000-90000.

### 5.4.6.1 Branch Wise Monthly Salary of the Respondents

The present study discloses that in branch wise category, 29.6 per cent of the Electronics and Communication Engineering graduates, 28.8 per cent of the Civil Engineering graduates, 26.8 per cent of the Mechanical Engineering graduates, 25.2 per cent of the Electrical and Electronics graduates had an salary between ₹ 10000-30000.

**Table 5.30**

**Branch Wise Monthly Salary of the Respondents (%)**

| Monthly Income | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Below 10000 | 0 | 0.4 | 0.8 | 1.6 | 0.8 | 0 | 0.4 | 0 | 0 | 0.8 | 0.8 | 0.8 | 0 | 0.4 | 0.4 | 0 | 0 | 0 | 0.4 | 0 |
| 10000-30000 | 5.6 | 7.6 | 7.6 | 6.8 | 13.2 | 0 | 9.6 | 3.6 | 6.1 | 10 | 10 | 6.4 | 8.4 | 6 | 13.6 | 0 | 10.4 | 1.6 | 8 | 7.2 |
| 30000-50000 | 1.6 | 3.2 | 2 | 0 | 4.4 | 0 | 3.6 | 1.2 | 1.6 | 0.8 | 0.8 | 1.6 | 2.8 | 1.2 | 3.2 | 0 | 6 | 0.4 | 1.6 | 0.4 |
| 50000-70000 | 0.4 | 0.4 | 1.2 | 0 | 1.2 | 0 | 1.2 | 0 | 0 | 0 | 0 | 0 | 1.2 | 0 | 1.6 | 0 | 1.6 | 0.4 | 0 | 0.4 |
| 70000-90000 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 |
| Above 90000 | 0.4 | 0 | 0.4 | 0 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 | 0 | 0 | 0.8 | 0 |

Source: Primary Survey

Table 5.30 shows the branch wise classification of the details of salary. Majority of the respondents earned their salary between ₹ 10000-30000. It is seen that 16.1 per cent of the Computer Science engineers received ₹ 10000-30000 per month in Ernakulam district and in Thiruvananthapuram it was 15.2 per cent. In Thiruvananthapuram district, 16.4 per cent of the Electronics and Communication engineers earned between ₹ 10000-30000 and in the district of Ernakulam it was 13.2 per cent. Only an insignificant category got a salary above ₹ 90000 per month.

## 5.4.7 Total Years of Service

Service years help to attain a good salary and promotion facilities.Experienced engineers are preferred in every interview because it will help to increase the productivity of the

institutions. Years of service help the employees to realize their potential in an environment.

**Table 5.31**

**Total Years of Service**

| Year of Service | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Below 1 year | 5<br>(2) | 15<br>(6) | 5<br>(2) | 6<br>(2.4) | 31<br>(6.2) |
| 1-3 Year | 137<br>(54.8) | 76<br>(30.4) | 148<br>(59.2) | 56<br>(22.4) | 417<br>(83.4) |
| 3-6 Year | 14<br>(5.6) | 1<br>(0.4) | 26<br>(10.4) | 5<br>(2) | 46<br>(9.2) |
| Above 6Year | 2<br>(0.8) | 0<br>(0) | 3<br>(1.2) | 1<br>(0.4) | 6<br>(1.2) |
| Total | 158<br>(63.2) | 92<br>(36.8) | 182<br>(72.8) | 68<br>(27.2) | 500<br>(100) |

Source: Survey Data (Figures in brackets show parentheses)

As per table 5.31, it is clear that 417 (83.4 per cent) and 46 (9.2 per cent) belong to total year of services between 1-3 years and 3-6 years respectively. One of the important points to be noticed from table 5.28 is that, the share of total years of service above six years is just 1.2 per cent. There is least representation of total years of service above six years. In the case of Ernakulam 137 have a service of between 1 to 3 years.

### 5.4.7.1 Branch Wise Classification of the Total Years of Service.

In the branch wise classification of total years of service it is found that 32.4 per cent of the Computer Science students, 32 per cent of the Electronics and Communication students had 1- 5 years of experience. 6.4 per cent of the Electrical and Electronics graduates had 5-10 years of experience in work.

## Table 5.32

**Branch Wise Classification of the Total Years of Service (%)**

| Total Years of Service | Ernakulam | | | | | | | | | | Thiruvananthapuram | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECE | | CE | | ME | | EEE | | CSE | | ECE | | CE | | ME | | EEE | | CSE | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Below 1 Year | 0 | 2.4 | 3.2 | 1.2 | 1.2 | 0 | 0.8 | 1.2 | 0 | 2.4 | 0.4 | 1.2 | 3.2 | 1.2 | 0.8 | 0 | 0.4 | 1.6 | 0.4 | 0.8 |
| 1 Year -5 Year | 6.8 | 9.2 | 6.8 | 6.4 | 17.2 | 0 | 14 | 4.8 | 8 | 7.6 | 11.2 | 4.8 | 7.2 | 4.8 | 16.8 | 0 | 12 | 0.4 | 9.6 | 7.2 |
| 5 Year-10 Year | 1.6 | 0 | 0.8 | 0.8 | 0.8 | 0 | 0.8 | 0 | 0.4 | 0 | 0 | 0 | 2 | 1.6 | 2 | 0 | 5.6 | 0 | 0.4 | 1.2 |
| 10Year-15 Year | 0 | 0 | 0.4 | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 | 0 | 0 | 0.4 | 0 |
| Above 15 Year | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Source: Survey Data

Table 5.32 reveals that, out of the total respondents, 18.8 per cent of Electrical and Electronics graduates had 1-5 years of service in Ernakulam. Whereas 17.2 per cent of the Mechanical branch had 1-5 years of service. One of the interesting points to be noticed from this table is that no respondents had above 15 years of service in both districts. In Thiruvananthapuram district, majority of the respondents from Mechanical (16.8%) and Computer Science (16.8 %) had a total experience of 1-5 years. The representation of the engineers having experience between 10 to 15 years was low.

### 5.4.8 Duration Spent to Get a Job

The study observed that period spent to attain a job is a crucial factor in employment. To get a good employment, duration spent is an important element. Most of the graduates agreed that it was very difficult to gain a good job after graduation. The study noticed that most of the engineering graduates spent considerable time to attain a job.

**Table 5.33**

**Duration Spent to Get a Job**

| Duration spent to get a job | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| No period | 6 (2.4) | 9 (3.6) | 1 (0.4) | 2 (0.8) | 18 (3.6) |
| Below 1 year | 92 (36.8) | 57 (22.8) | 103 (41.2) | 41 (16.4) | 293 (58.6) |
| 1-2 year | 55 (22) | 25 (10) | 67 (26.8) | 23 (9.2) | 170 (34) |
| 2-3 year | 5 (2) | 1 (0.4) | 8 (3.2) | 2 (0.8) | 16 (3.2) |
| Above 3 year | 0 (0) | 0 (0) | 3 (1.2) | 0 (0) | 3 (0.6) |
| **Total** | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.33 reveals that, out of the total 500 respondents, majority, 293 (58.6%) belonged to below one-year category, to get a job. Whereas 170 (34 %) belonged to the 1 to 2 year category. One of the interesting points to be noticed from table 5.30 is that 0.6 per cent of the respondents belonged to above 3 years category to attain a good job.

## 5.4.9 Job Suited for Qualification

Every graduate desired to achieve a suitable job as per their qualification. If the qualification is high, the job should be according to their qualification. The present session analyses the situation of getting suitable job as per the qualification of the engineering graduates.

**Table 5.34**

**Job Suited for Qualification**

| Job suited for qualification | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Yes | 148 (59.2) | 84 (33.6) | 169 (67.6) | 65 (26) | 466 (93.2) |
| No | 10 (4) | 8 (3.2) | 13 (5.2) | 3 (1.2) | 34 (6.8) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

It is seen that 93.2 per cent of the respondents revealed that their job suited their qualification. Only 6.8 per cent of the respondents had the opinion that their job did not suit their qualification. At this juncture,it can be stated that an element of under employment creeps into the scene. A well-qualified person who cannot get a job which completely matches his or her qualification is underemployed. Hence,the present session can be concluded by analyzing that 6.8 per cent of the engineers were underemployed.

## 5.4.10 Changes of Working Places

Changes are unavoidable for modern life situations as well as in the work place. The variations in work had its positive and negative impacts on the workers of the institutions. There were many reasons for changing workplaces like low wage rate, lack of good work environment and more working hours.

**Table 5.35**

**Changes of Working Places**

| Changes of working places | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| No changes | 108 (43.2) | 75 (30) | 141 (56.4) | 59 (23.6) | 383 (76.6) |
| One times | 18 (7.2) | 12 (4.8) | 26 (10.4) | 6 (2.4) | 62 (12.4) |
| Two times | 20 (8) | 4 (1.6) | 12 (4.8) | 2 (0.8) | 38 (7.6) |
| More than 2 | 12 (4.8) | 1 (0.4) | 3 (1.2) | 1 (0.4) | 17 (3.4) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

The table quite obviously shows that majority of the respondents, i.e., 76.6 per cent (383) had no changes in their working places. In district wise analysis, it was seen that 80 percent from Thiruvananthapuram did not change their job compared to the district of Ernakulam,which was 73.2 per cent.Among total respondents,12.4 per cent agreed that they changed their job once after first placement and 7.2 per cent were of the opinion that twice they changed their job after first placement. Only 3.4 per cent of the respondents changed their job more than twice.

## 5.4.11 Locations of Employment

In this section, explanations of the different employment locations that the engineering graduates were working are given. Here, locations of employment were divided into three i.e. Kerala, outside Kerala and outside India.

**Table 5.36**

**Locations of Employment**

| Employment Locations | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Kerala | 139 (55.6) | 84 (33.6) | 151 (60.4) | 62 (24.8) | 436 (87.2) |
| Outside Kerala | 12 (4.8) | 7 (2.8) | 24 (9.6) | 6 (2.4) | 49 (9.8) |
| Outside India | 7 (2.8) | 1 (0.4) | 7 (2.8) | 0 (0) | 15 (3) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.36 presents that majority of therespondents (87.2 %) were working in Kerala, 9.8 per cent worked on outside Kerala and only 3 per cent worked outside India.

## 5.4.12 Problems Faced by the Engineering Graduates.

One of the main problems faced by engineering graduates is that there are too many engineering graduates in Kerala. This leads to chronic unemployment in engineering sector. Graduates due to lack of job availability engage in different jobs like peon, school teacher, and BPO (Business Process Outsourcing). In each employment, the worker faces different hitches. The present study exposes the main problems faced by engineering graduates in Kerala. Low salary, more working hours, less chance of promotion, poor working environment, harassment, low motivation, performance issues, and discrimination are the problems of engineering graduates. The place of work should be a good location withpleasant experiences to nurture. The problems experienced in the work place decrease the performance and productivity and reduce the happiness of the person concerned. The present session analyses the problems faced by the engineering graduates in Kerala. Table 5.35 narrates the problems faced by the engineering graduates.

**Table 5.37**

**Problems Faced by the Engineering Graduates**

| Problems | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Low Salary | 106 (42.4) | 56 (22.4) | 118 (47.2) | 34 (13.6) | 314 (62.8) |
| More Working hours | 35 (14) | 15 (6) | 17 (6.8) | 5 (2) | 72 (14.4) |
| Poor Working Environment | 0 (0) | 0 (0) | 22 (8.8) | 2 (0.8) | 24 (4.8) |
| Less Chance of Promotion | 15 (6) | 6 (2.4) | 32 (12.8) | 9 (3.6) | 62 (12.4) |
| Family Consideration | 2 (0.8) | 13 (5.2) | 13 (5.2) | 18 (7.2) | 46 (9.2) |
| Others | 0 (0) | 2 (0.8) | 0 (0) | 0 (0) | 2 (0.4) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

It is evident from the data (Table 5.37) that majority of the respondents i.e., 62.8 per cent have viewed that low salary was the main problem of the job and the majority of them (64.8%) were in Ernakulam district, followed by 60.8 per cent in the district of Thiruvananthapuram. 14.4 percent of the respondents were of the opinion that more working hours were the main problem faced from job and 4.8 per cent respondents were of the opinion that less chance of promotion was one of the problems of the job. 9.2 per cent of the respondents were of the opinion that lack of time to spend with family was one of the problems they faced.In gender wise analysis, female respondents were giving priority to family concerns. Remaining 0.4 per cent respondents opinioned that they facedother problems which they were reluctant to disclose.

## 5.4.13 Satisfaction from the Present Job

The present session deals with the level of satisfaction from the job which the graduates of engineering stream were engaged in. Work satisfaction refers to fulfillment of basic needs and it helps as a source of happiness. It is the degree to which the person feel confident or discontented with their jobs.

**Table 5.38**

**Satisfaction from the Present Job**

| Opinion about satisfaction from job | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Yes | 113 (45.2) | 57 (22.8) | 138 (55.2) | 55 (22) | 363 (72.6) |
| No | 45 (18) | 35 (14) | 44 (17.6) | 13 (5.2) | 137 (27.4) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

It is evident from table 5.38 that only 72.6 per cent of the respondents were of the opinion that they were getting satisfaction from their job. Only 27.4 per cent of the respondents had the opinion that there was no satisfaction from their job.

## 5.4.14 Intensity to Work Abroad

Moving to a new country leads to push upto a comfort zone. It helps to attain personal development, study new skills, learn other languages, expand the network in different countries and find a good career. The study explores that there is an intense desire for the engineering graduates to work abroad.

**Table 5.39**
**Intensity to Work Abroad**

| Opinion about work abroad | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Yes | 75 (30) | 82 (32.8) | 94 (37.6) | 33 (6.6) | 284 (56.8) |
| No | 83 (33.2) | 10 (4) | 88 (35.2) | 35 (14) | 216 (43.2) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.39 specified that 56.8 per cent of the sample had intensity to work abroad, and 43.2 per cent of the respondents were not ready to work abroad. In district wise classification, 62.8 per cent of the respondents from the district of Ernakulam expressed their intensity to work abroad. At the same time, 44.2 per cent of the respondents had the desire to work abroadin the district of Thiruvananthapuram. This exposes that many of the engineering graduates wanted to work abroad due to various reasons such as more salary, status, increasing the standard of living.

## 5.4.15 Working Situation.

Respondents gave their opinion about the working situation of institutions or companies. It gave clear idea about respondent's working situation. Working situation or condition of work site is an important element in every employment. The low facilities of work situation irritated the workers and it did not satisfy the workforce. There were many factors which affected the good working situation. They are salary, facilities, promotion, respect of personal rights and trade union activities. These factors will help to make a good working atmosphere.

### 5.4.15.1 Satisfaction of Working with the Organization

The present study discloses that job satisfaction and organization are important factors in working situation. Every organization allots time and effort for the development of human resources.Satisfaction of work with a particular organization is a remarkable point. Work satisfaction provided better productivity to their company or institution. Table 5.40 narrates the satisfaction at work place.

**Table 5.40**
**Satisfaction in Work Place**

| Opinion about satisfaction of working institution | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 3 (1.2) | 3 (1.2) | 2 (0.8) | 3 (1.2) | 11 (2.2) |
| Disagree | 19 (7.6) | 12 (4.8) | 23 (9.2) | 10 (4) | 64 (12.8) |
| Neutral | 102 (40.8) | 50 (20) | 113 (45.2) | 39 (15.6) | 304 (60.8) |
| Agree | 32 (12.8) | 24 (9.6) | 39 (15.6) | 15 (6) | 110 (22) |
| Strongly Agree | 2 (0.8) | 3 (1.2) | 5 (2) | 1 (0.4) | 11 (2.2) |
| **Total** | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Out of the total sample, 24.2 per cent opined that they 'strongly agree' or 'agree' with satisfaction of working with their organization. The same share is 24.4 per cent in the district of Ernakulam and 24 per cent in the district of Thiruvananthapuram. 12.8 per cent had the opinion that they 'disagree' with the satisfaction level of working with the particular institution. Majority (60.8 %) of the total respondents were'neutral' with the satisfaction of working in their institution. At the same time, 2.2 per cent of the respondents were of the opinion that they 'strongly disagree 'with the level of satisfaction. At this juncture, it can be observed that the respondents were more neutral in expressing their opinion than being frank.

## 5.4.15.2 Details of salary

Salary is a payment made by employer to an employee. Salary plays a distinctive role in the productivity of the work. If an employee gets a good salary it will help him or

her to work more sincerely. This study generally looked for the engineering graduates' opinion about their management in the institutions.

**Table 5.41**

**Details of salary**

| Opinion about salary providing company | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 10 (4) | 5 (2) | 9 (3.6) | 1 (0.4) | 25 (5) |
| Disagree | 71 (28.4) | 38 (15.2) | 94 (37.6) | 30 (12) | 233 (46.6) |
| Neutral | 65 (26) | 38 (15.2) | 68 (27.2) | 34 (13.6) | 205 (41) |
| Agree | 11 (4.4) | 10 (4) | 11 (4.4) | 3 (1.2) | 35 (7) |
| Strongly Agree | 1 (0.4) | 1 (0.4) | 0 (0) | 0 (0) | 2 (0.4) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Among the details of companies giving maximum salary, 46.6 per cent of the sample respondents disagreed that the companies gave good salary. 7 per cent and 0.4 per cent of the respondents respectively rated it as 'strongly agree' and 'agree'. Most of them were from Ernakulam (9.2%) followed by Thiruvananthapuram (5.6%) district. 41 per cent of the survey respondents said that the companies gave just subsistence level salary. At the same time 5 per cent of the respondents rated it as 'strongly disagree'. It is observed that very small per cent of the respondents were given a clear opinion to their working situation. The low salaries persons were from private institutions.

### 5.4.15.3 Management and Personal Rights.

A cordial relationship between management and labourers is essential to have a good working atmosphere. It helps to create good productivity. Taking time to listen to the problems of the workers is necessary to make them work efficiently in their job. Management of the institutions should give importance to the personal rights of theiremployees and, it helps to increase the performance of institutions .

**Table 5.42**

**Management and Personal Rights.**

| Opinion about management respect personal rights | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 4 (1.6) | 1 (0.4) | 0 (0) | 2 (0.8) | 7 (1.4) |
| Disagree | 88 (35.2) | 40 (8) | 82 (32.8) | 30 (12) | 240 (48) |
| Neutral | 44 (17.6) | 28 (11.2) | 65 (26) | 29 (11.6) | 166 (33.2) |
| Agree | 20 (4) | 19 (7.6) | 32 (12.8) | 5 (2) | 76 (15.2) |
| Strongly Agree | 2 (0.8) | 4 (1.6) | 3 (1.2) | 2 (0.8) | 11 (2.2) |
| **Total** | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Jointly, 50.6 per cent of the respondents experienced positive changes (strongly agree, agree and neutral) in the management respecting their personal rights. Majority of them (54.4 %) were from Thiruvananthapuram followed by Ernakulam (42.8 %). 48 per cent of the respondents disagreed with the opinion that management respected their personal rights and 1.4 per cent of the respondents strongly disagreed to it.

## 5.4.15.4 Role of Trade Union

Trade union means an association of workers forming a legal unit or legal personhood. It represents workers from several companies in same industry. Every industry includes work or trade unions. At this juncture it is observed that trade unions were not active in institutions surveyed.

**Table 5.43**

**Role of Trade Union**

| Opinion about trade union is active in institution | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 8 (3.2) | 10 (4) | 12 (4.8) | 2 (0.8) | 32 (6.4) |
| Disagree | 113 (45.2) | 58 (23.2) | 106 (42.4) | 37 (14.8) | 314 (62.8) |
| Neutral | 26 (10.4) | 10 (4) | 40 (16) | 20 (8) | 96 (19.2) |
| Agree | 11 (4.4) | 12 (4.8) | 22 (8.8) | 8 (3.2) | 53 (10.6) |
| Strongly Agree | 0 (0) | 2 (0.8) | 2 (0.8) | 1 (0.4) | 5 (1) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Generally, 30.8 per cent of the respondents experienced that (strongly agree, agree, and neutral) trade unions were more active in their institutions. In Ernakulam district,0.8 per cent, 9.2 per cent and 14.4 per cent of the respondents were agree with trade unions were more active in their institutions and in Thiruvananthapuram, it was 1.2 percent, 12 percent and 24 per cent respectively. 62.8 per cent of the respondents 'disagree' with the view that trade unions were more active in their companies and 6.4 per cent strongly disagreed that the trade unions were active.

## 5.4.15.5 Passive Trade Union

The present session explains the opinions of the graduates about the role of trade union in their working institutions. The central role of trade union is to ensure the well-being of its members such as protection of the interests of its members and achieving higher wages by securing economic benefits.

**Table 5.44**

**Passive Trade Union**

| Opinion about trade union has no role in company | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 3 (1.2) | 1 (0.4) | 1 (0.4) | 2 (0.8) | 7 (1.4) |
| Disagree | 15 (6) | 12 (4.8) | 12 (4.8) | 8 (3.2) | 47 (9.4) |
| Neutral | 25 (10) | 10 (4) | 43 (17.2) | 18 (7.2) | 96 (19.2) |
| Agree | 108 (43.2) | 57 (22.8) | 109 (43.6) | 36 (14.4) | 310 (62) |
| Strongly Agree | 7 (2.8) | 12 (4.8) | 17 (6.8) | 4 (1.6) | 40 (8) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

The mainstream of the respondents (62 %) reported that trade union had no role in their institutions. 19.2 per cent were of the opinion that they were neutral in their position. However 9.4 per cent of the respondents reported that they ‘disagree’ in trade union having any role in their institutions. Only 8 per cent strongly agreed that trade union ha role in their institutions.

## 5.4.15.6 Relationship between Management and Staff.

One of the reasons for leaving the job is lack of good relationship between management and staff. Friendly and cordial feeling towards the staff play a significant role in the working of the entire institution which communicates within itself and world outside.

**Table 5.45**

**Relationship between Managementand Staff.**

| Opinion about management not interested feeling of staff | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 5 (2) | 1 (0.4) | 2 (0.8) | 3 (1.2) | 11 (2.2) |
| Disagree | 12 (4.8) | 10 (4) | 23 (9.2) | 3 (1.2) | 48 (9.6) |
| Neutral | 63 (25.2) | 42 (16.8) | 92 (36.8) | 41 (16.4) | 238 (47.6) |
| Agree | 77 (30.8) | 34 (13.6) | 64 (25.6) | 21 (8.4) | 196 (39.2) |
| Strongly Agree | 1 (0.4) | 5 (2) | 1 (0.4) | 0 (0) | 7 (1.4) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

As per table 5.45, it is clear that out of 500 respondents, 47.6 per cent reported that they were neutral that management of the institution was not interested in the feeling of the staff. One of the important points to be noticed from the table is that, majority of the respondents had neutral opinion. 1.4 per cent strongly agreed that the management was not interested in the feeling of the staff. The share of strongly disagreed was just 2.2 per cent.

### 5.4.15.7 Atmosphere of Friendliness

Every work place has to have a friendly feeling between management and employees. A workplace is a location where someone works for his or her employer and it is, a place of employment. Such a place can range from a home office to a large office building or factory. Expected from industrialized societies, the workplace is one of the most important social spaces other than the home, constituting the central concept for several entities.

**Table 5.46**

**Friendly Feeling of Management & Staff**

| Opinion about friendly feeling of management and staff | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 4 (1.6) | 2 (0.8) | 1 (0.4) | 1 (0.4) | 8 (1.6) |
| Disagree | 67 (26.8) | 32 (12.8) | 60 (24) | 18 (7.2) | 177 (35.4) |
| Neutral | 63 (25.2) | 38 (15.2) | 87 (34.8) | 40 (16) | 228 (45.6) |
| Agree | 19 (7.6) | 17 (6.8) | 30 (12) | 7 (2.8) | 73 (14.6) |
| Strongly Agree | 5 (2) | 3 (1.2) | 4 (1.6) | 2 (0.8) | 14 (2.8) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.46 clearly indicates that a grand majority of the respondents (228) (45.6 %) belong to neutral opinion. Out of 500 total respondents, 14.6 per cent respondents agreed that there was a friendly feeling between management and staff. And 2.8 percent respondents strongly agreed to the view that management respected their feelings. At the same time, 35.4 per cent disagreed that there was a friendly feeling between management and staff. 1.6 per cent of the respondents strongly disagreed this statement.

## 5.4.15.8 Working Hours

In employed life, more working hourscreate the employees to decrease the level of productivity. The study observed that more working hours affect the mental health of the workers. And it resultsin problems in close relationships, which results in depression.

**Table 5.47**
**Working Hours**

| Opinion about more working hours are included the institutions | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 2 (0.8) | 1 (0.4) | 1 (0.4) | 2 (0.8) | 6 (1.2) |
| Disagree | 5 (2) | 3 (1.2) | 11 (4.4) | 5 (2) | 24 (4.8) |
| Neutral | 33 (13.2) | 17 (6.8) | 39 (15.6) | 19 (7.6) | 108 (21.6) |
| Agree | 108 (43.2) | 51 (20.4) | 106 (42.4) | 34 (13.6) | 299 (59.8) |
| Strongly Agree | 10 (4) | 20 (8) | 25 (10) | 8 (3.2) | 63 (12.6) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Majority of the respondents, (72.4%) report that they are forced to work more hours in their institutions. Six per cent did not have this experience. Some of the respondents (21.6 %) gave the neutral opinion. Table 5.47 clearly shows that majority reveals that there is overtime work which is not paid.

## 5.4.15.9 Importance Given to the Employees

Every institution must give importance to their workers. It leads the workers to perform very well and increase the productivity of the company. But, some of the

institutions do not give importance to their workers. This creates a situation of low profit making and low performance of workers. This has affected the overall achievement of the institutions.

**Table 5.48**

**Importance Given to the Employees**

| Opinion about institutions give more importance of their workers | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 3 (1.2) | 0 (0) | 2 (0.8) | 1 (0.4) | 6 (2.4) |
| Disagree | 88 (35.2) | 44 (17.6) | 80 (32) | 37 (14.8) | 249 (49.8) |
| Neutral | 43 (17.2) | 33 (13.2) | 71 (28.4) | 20 (8) | 167 (33.4) |
| Agree | 19 (7.6) | 11 (4.4) | 25 (10) | 9 (3.6) | 64 (12.8) |
| Strongly Agree | 5 (2) | 4 (1.6) | 4 (1.6) | 1 (0.4) | 14 (2.8) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

2.8 per cent of the respondents strongly agreed that workers had given their importance. By the management majority of them (49.8%) disagreed to this statement. Only a few respondents (2.4%) reported that companies do not give importance to their workers. 33.4 per cent of the respondents had neutral opinion.

## 5.4.15.10 Promotions in the Job

Promotion in job is a reward for the employees for good performance in work and it will produce more output for the institutions. The study focused on the opinionof the engineering graduates regarding their place of work. It is discussed in table 5.49.

**Table 5.49**

**Promotions in the Job**

| Opinion about job not providing promotion | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Strongly Disagree | 3 (1.2) | 1 (0.4) | 2 (0.8) | 2 (0.8) | 8 (1.6) |
| Disagree | 6 (2.4) | 3 (1.2) | 12 (4.8) | 6 (2.4) | 27 (5.4) |
| Neutral | 24 (9.6) | 16 (6.4) | 40 (16) | 16 (6.4) | 96 (19.2) |
| Agree | 114 (45.6) | 61 (24.4) | 110 (44) | 38 (15.2) | 323 (64.6) |
| Strongly Agree | 11 (4.4) | 11 (4.4) | 18 (7.2) | 6 (2.4) | 46 (9.2) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.49 presents that collectively 19.2 per cent of the respondents indicated that there is a neutral opinion about job promotions. 7 per cent of the respondents do not agree to this opinion and explained that institutions providing promotion facilities. At the same time 73.8 per cent of the respondents strongly agreed that many institutions were not providing promotion facilities.

## 5.4.16 Attractive Factors in Job

Majority of the sample (80.2 %) were of the opinion that status of the job was an attractive factor. 16.2 per cent of the respondents viewed that salary was an attractive factor in job. The factors affecting employment were job status, salary, promotion facilities, low working hours.

**Table 5.50**

**Attractive Factors in Job**

| Most attractive factor from job | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Salary | 16 (6.4) | 13 (5.2) | 35 (14) | 17 (6.8) | 81 (16.2) |
| Job status | 136 (54.4) | 76 (30.4) | 141 (56.4) | 48 (19.2) | 401 (80.2) |
| Less working hours | 2 (0.8) | 0 (0) | 2 (0.8) | 2 (0.8) | 6 (1.2) |
| Others | 4 (1.6) | 3 (1.2) | 4 (1.6) | 1 (0.4) | 12 (2.4) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

Table 5.50 elucidates that 80.2 per cent of the respondents reported that job status was one of the most attractive factors in job. One of the important points to be noticed from table 5.47 is that, out of the 500 respondents, 16.2 per cent of the respondents reported that salary was one of the most attractive factors in the job. 2.4 per cent of the respondents reported that other factors were attractive in their job. A limited per cent (1.2 %) of respondent explained that the attractive factor from job was fewer working hours.

## 5.5 Descriptive Statistics: Age, Percentage of Marks in Engineering Degree, Income of the Employed graduates.

In the present study, descriptive statistics for the analysis of age, mark and income were used. This gave a clear picture of the statistical values of these variables.

**Table 5.51**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Age | 500 | 22 | 38 | 27.18 | 2.529 |
| Marks | 500 | 40 | 85 | 64.31 | 5.239 |
| Salary Details | 500 | 7000 | 120000 | 26774.00 | 15529.109 |
| Valid N (listwise) | 500 | | | | |

Source: Survey Data

Table 5.51 gives a descriptive statistical analysis of the age, marks and income. Descriptive statistics are useful for describing the basic features of data. Table 5.48 gives the central tendency and dispersion of each variables. Standard deviation is used to determine how data is spread out from the mean. A higher standard deviation value indicates greater spread in the data. The mean of the age of engineering degree holder was 27.18 and its standard deviation was 2.529. The mean of marks was 64.31 and the standard deviation was 5.239. At the same time, the mean of income was 26774 and standard deviation was 15529.109.

## 5.6. Independent samples t-Test

The independent sample t-test compares the means of two independent groups in order to determine whether there is any statistical difference.

**Table 5.52**
**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Salary Details | Male | 340 | 28470.59 | 16838.878 | 913.216 |
| | Female | 160 | 23168.75 | 11534.592 | 911.890 |

Source: Survey Data

Table 5.52 explains the group statistics of the salary of engineering graduates. It displays the summary of measures of the variable selected, for the independent sample t-test for the both groups of male and female. The mean of salary of the male engineering graduates was 28470.59 and the mean of female graduate was 23168.75. The standard deviation of salary of the male graduate was 16838.87 and female was 11534.59.

**Table 5.53**
**Independent samples Test**

| | | t-test for Equality of Means | | |
|---|---|---|---|---|
| | | T | df | Sig. (2-tailed) |
| Salary Details | Equal variances assumed | 3.604 | 498 | .000 |
| | Equal variances not assumed | 4.108 | 433.394 | .000 |

Source: Survey Data

The analysis indicates that t-value was 3.60 and associated significance value was .000. Hence, the study accepts the null hypothesis for equality of means. There is a statistically strong significant differences in salary of the engineering graduates for both male and female.

### 5.6.1 Result of the 2nd Hypothesis of the study

The second hypothesis of the study stated that 'there was a positive relationship between gender and salary of the employed engineering graduates in Kerala. The result of the Independent Sample t-Test brought out the significant relationship between the variables salary and gender. Male graduates received more salary than female graduates. Thus, the null hypothesis is accepted.

## 5.7 Correlation between Income and Total Years of Service.

In the present section,an analysis of income and total years of service is done. Table 5.54, gives a detailed description of the correlation between income and total years of service.

**Table 5.54**

**Correlations**

| | | Total Years of Service | Salary Details |
|---|---|---|---|
| Total Years of Service | Pearson Correlation | 1 | .355** |
| | Sig. (2-tailed) | | .000 |
| | N | 499 | 499 |
| Salary Details | Pearson Correlation | .355** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 499 | 500 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | |

Source: Survey Data

In this analysis, the results of the correlation are explained.The years of service and salary have a positive correlation. The correlation coefficient is .355 and significance level (p-value) is .000. Since p-value is less than 0.05, the variables have a highly significant positive correlation.

### 5.7.1 Result of 3rd Hypothesis

Third hypothesis stated that 'there existed differences between salary and years of service of the engineering graduates'. The years of service and salary have a positive correlation. As the years of service increases, the salary of the graduates increase due to annual increment and other benefits. Thus the hypothesis is accepted.

## 5.8 Summary

The chapter is recapitulated in this session. The pathetic situations of the engineering graduates in Kerala were depicted in the chapter. The engineering degree holders have attained various jobs and these employments are different in nature, types and conditions. The present study found out that 52.6 per cent of the graduates had worked in IT field, 18.8 per cent worked in other fields like clerical job, government job, and Business Process Outsourcing (BPO). 11.4 per cent of the graduates worked in construction, 9.6 per cent worked in mechanical field and 5.8 per cent worked in bank. This brought out the finding that students from all disciplines were working in IT and other work. They were not working in the areas they have been specialized. The study mainly focused that 90 per cent of the employed graduates were working in private firms in Kerala. 7.8 per cent had their work in government institutions and 2.2 per cent were working in aided (private and government) institutions. The study analyzed that the main problem of engineering graduates were low salary, less chance of promotion, poor working situation, and family considerations.

The different tools like, Descriptive Statistics, Independent Sample t-Test, Correlation were used for the study. The results of the independent sample t-test showed that the mean of salary of the male engineering graduates was 28470.59 and the mean of female graduate was 23168.75. This revealed that there was a statistically significant difference in salary of the engineering graduates for both male and female. In the analysis, it was found that there was a positive correlation between years of service and income. Thus, employment of engineering graduates in Kerala portrayed that the engineering degree holders do not get the opportunity to work in the areas they had been trained for. They were working for low salary with high potential and skill. This may be due to the situation of low demand and low quality along with high supply of engineering graduates in Kerala.

## 6.1 Introduction

In the previous chapter a detailed analysis on the nuances of employment of engineering graduates was dealt with and now the study proceeds to analyze the employability of engineering graduates in Kerala. Chapter five examined the nature, types and conditions of employment that the engineering graduates had received. As per the objectives set up in the study the factors determining the employability of engineering graduates are analyzed in the current chapter. The employability of the engineering graduates are an important element to get an employment. Hence, the present chapter deals with the factors affecting employability of engineering graduates in Kerala. The Factor Analysis is used to find out the important factors affecting employability of engineering graduates in Kerala. In this chapter, the primary data is analyzed in the Career EDGE model frame.

## 6.2 Employability

The study brings to the notice that every graduate has been affected by the factors of employability. There are different factors affecting the employed engineering graduates'employability. In the study, as explained in the methodology (section 1.8.4), the samples used were from employed engineering graduates, which is required to find out the employability. Employability is required for a person to attain a good satisfying job. Employability plays an important role in success of an individual. Most of the engineering graduates have given priority to the factors of employability. The qualities and skills of the graduates are conceptualized differently by different universities and higher education systems. The employability of any section of the population has several features that are influenced by the overall economy of the region. Employability skills are not attained immediately. The individual has to find out the important skill sets as obligatory by the potential bosses from the various announcements unrestricted by them from time to time. Every graduate desire for it, every educational institution attempts for it, and every employer waits for it. It is the educational institution and the employers' prerogative to decide on the curriculum of the course.

The employability is being inclined by the nature and the type of the skills conveyed to the graduates and the perception by the investors. The students who are the ultimate winners and one, who lag behind in their academic progress, must yield themselves to understanding of the significance of the skills to be put on and the teachers

who are the main instruments should sow the correct seeds at the correct time in the minds of the students.In the present study, an attempt was made to examine the skills of employability of employed engineering graduates in relation to their personal differences.

## 6.3 Important Skills Required for Job

The present study intensely looked for the responses of the sample. The analysis revealed that for the placement of an engineer, developments of skills are very important. Communication skill is one of the obligatory skills required for the employability of an engineer. Table 6.1 narrates the details of the important skills required for the job of an engineer. It is noticed that 47.2 per cent came to the conclusion that communication skill was the most important skill required for job. The study also brought to light that 11.8 per cent came to the conclusion that subject knowledge was required for job. And 11 per cent of the respondents gave the response that engineering skill was required for a job. Problem solving skill (8.8 per cent) is another skill required for a job.7.4 per cent of the respondents came to the conclusion that practical knowledge was required for a job. The study displayed that only 0.4 per cent came to the conclusion that decision making skill was important.

**Table 6.1**
**Important Skill Required for Job**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Communication skill | 236 | 47.2 | 47.2 | 47.2 |
| | Decision making skill | 2 | .4 | .4 | 47.6 |
| | Engineering skill | 55 | 11.0 | 11.0 | 58.6 |
| | Listening skill | 4 | .8 | .8 | 59.4 |
| | Planning& organizing | 24 | 4.8 | 4.8 | 64.2 |
| | Practical knowledge | 37 | 7.4 | 7.4 | 71.6 |
| | Presentation skill | 6 | 1.2 | 1.2 | 72.8 |
| | problem solving | 44 | 8.8 | 8.8 | 81.6 |
| | Programming skill | 1 | .2 | .2 | 81.8 |
| | Self confidence | 15 | 3.0 | 3.0 | 84.8 |
| | subject knowledge | 59 | 11.8 | 11.8 | 96.6 |
| | Time management | 17 | 3.4 | 3.4 | 100.0 |
| | Total | 500 | 100.0 | 100.0 | |

Source: Survey Data

Table 6.1 specifies that there are various skills required for a job. Skill levels are different and are important to attain a job. Communication skill, engineering skill, subject knowledge, engineering skill, problem solving skill, practical knowledge, Planning and organizing skill are important skills required for job. In the analysis it wasfound that communication skill was the important skill desired to attain a good job. Every institution or employer prefers a person with good communication skill to employ in their institution. The most desirable quality in a newly hired person is effective communication skill. Communication skills are essential for the successful future career of a student. In today's competitive world, communication skill is the most sought after quality of an educated person. Reading, writing and listening carefully are the three most important communication skills for students. Another important skill is subject knowledge.It is needed to do a particular job or work in a particular industry. These skills are essential in jobs and careers. The next is engineering skill, it is an important element in attaining a good job. Employers who are looking to hire engineers require in the people they hire to have engineering skills. Engineers should have a solid foundation in Science, Technology, Engineering, and Mathematics (STEM). The other skill is problem solving. It is extremely obligatory to have the ability to solve problems when a person is in a responsible post like that of an engineer especially in the modern technological and digital world.

Time management skill, self –confidence, presentation skill, planning and organizational skills were required to get good employment. Every institution must check their employee's skills at the time of interview. Self-confidence of the workers help them to work anywhere, in any situation, whether it is highly demanding or not. Time management skill helps to manage all the work in their institutions very accurately. If worker has a good time management skill, it helps the worker to be very effective. Presentation skill is yet another important skill for a job and it helps to increase the employees' level of confidence.

## 6.4 Additional Skill Required for Getting Employment

Every employment needs additional skills. It is very effective to find a job. In everyday life, the development of life skills helps the students to find new ways of thinking and solving problems. To cope with the increasing pace and change of modern life, students need new life skills such as the ability to deal with stress and frustration.

## Table 6.2
## Additional Skill Required for Getting Employment

| Opinion about Additional skill for job | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Yes | 154 (61.6) | 89 ( 35.6) | 181 (72.4) | 68 (27.2) | 492 (98.4) |
| No | 4 (1.6) | 3 (1.2) | 1 (0.4) | 0 (0) | 8 (1.6) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

The study displays that 492 (98.4 %) respondents expressed that additional skills were required for getting an employment. Only 1.6 per cent of the respondents agreed that additional skills were not important to get a job. Table 6.3 narrates those additional skills that are needed for getting a job. In the analysis,it is illustrated that the communication skill is an important additional skill required for getting a job. Additional skills help to increase the productivity of the employer.

## Table 6.3
## Additional Skill Required for Getting Employment

| Skills | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| communication skill | 151 | 30.2 | 30.2 | 30.2 |
| Engineering skill | 46 | 9.2 | 9.2 | 39.4 |
| Good attitude | 1 | .2 | .2 | 39.6 |
| Hardwork,confidence | 1 | .2 | .2 | 39.8 |
| Industrial exposure training | 1 | .2 | .2 | 40.0 |
| Listening skill | 2 | .4 | .4 | 40.4 |
| Organizing skill | 1 | .2 | .2 | 40.6 |
| Planning& Organizing | 16 | 3.2 | 3.2 | 43.8 |
| Practical knowledge | 74 | 14.8 | 14.8 | 58.6 |
| Presentation skill | 11 | 2.2 | 2.2 | 60.8 |
| problem solving | 86 | 17.2 | 17.2 | 78.0 |
| Self –confidence | 4 | .8 | .8 | 78.8 |
| Software relate skill | 3 | .6 | .6 | 79.4 |
| Subject knowledge | 78 | 15.6 | 15.6 | 95.0 |
| Time management | 25 | 5.0 | 5.0 | 100.0 |
| Total | 500 | 100.0 | 100.0 | |

Source: Survey Data

The study brings to the light that 30.2 per cent came to the conclusion that communication skill was one of the additional skills required for a job. The problem solving (17.2%) is another additional skill for getting a job. Every employment demands problem solving skill. It is one of the additional skills required in a company or institution. It will help to have good performance in job. The engineering graduates had given importance to additional skills which they expressed through responses. Subject knowledge is another additional skill to attain a respectable job. Good attitude, hard work and industrial exposure, software related skills are the additional skills required for attaining a god job.

## 6.5 Quality of the Project Undertaken

In engineering degree, project of their subject is very important. Quality was the main issue of this degree. Every project of good quality will help graduates to find a good job. After the engineering degree, the quality of project helps to find out suitable jobs. The multinational companies search for qualified graduates for job who have completed industrial projects of high quality. At the time of interview, additional marks are given for the projects completed from good industries. Quality of project is positively related to the prospects of employment. Hence, it can be stated that the quality of the project undertaken would help to shape the career of the candidate.

**Table 6.4**
**Quality of theProject Undertaken**

| Opinion about quality of project important to get a job | Ernakulam | | Thiruvananthapuram | | Total |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| Yes | 77 (30.8) | 46 (18.4) | 112 (44.8) | 41 (16.4) | 276 (55.2) |
| No | 81 (32.4) | 46 (18.4) | 70 (28) | 27 (10.8) | 224 (44.8) |
| Total | 158 (63.2) | 92 (36.8) | 182 (72.8) | 68 (27.2) | 500 (100) |

Source: Survey Data (Figures in brackets show parentheses)

The study observed that table 6.4 brought out the fact that quality of project was one of the element in determining the opportunity to acquire a job. Table 6.4 brings to the notice that 55.2 per cent agree to the statement that quality of the project the students take

up during their study is significant in getting good employment. This statement is rejected by 44.8 per cent. Generally it is observed that the quality of the project is non-compromising element.

## 6.6 Factors Affecting Employability of Engineering Graduates

Based on the different factors of employability, the study had applied seven point scale statements for detecting the factors affecting employability of engineering graduates in Kerala. The seven point scale consisted of Strongly Disagree, Disagree, Slightly Disagree, Neither agree nor disagree, Slightly Agree, Agree, Strongly Agree carrying scores one, two, three, four, five, six and seven respectively. The study applied Orthogonal Varimax Rotation method of Principal Component Analysis (PCA) to these observed variables in order to identify the factors influencing the employability of employed engineering graduates. The PCA explored the variables which were correlated to each other for the factor models, which wereimportant for exploration.

### 6.6.1 Factor Analysis among Employed Engineering Degree Holders

The present study used Factor Analysis to summarize data so that relationships and patterns could be easily interpreted and understood. Factor analysis was used to rearrange variables into a narrow set of cluster. In factor analysis,the observable variables were reduced to fewer latent variables which shared a common variance and were unobservable, which was reducing dimensionality.

The reasons for getting a job by the engineering graduates were analyzed using a measuring instrument of seven point scale consisting of 28 statements. All the statements were included in the analysis frame because of high extraction value. The responses in seven point scale were used with Factor Analysis to reduce the dimensions. Initiated on the primary survey conducted among engineering graduates, the study selected 28 variables. The first step is to assess the feasibility of PCA by applying Kaiser-Meyer-Olkin (KMO) and Bartlett's Test among the particular variables. The KMO statistic measures the ratio of the squared correlation between the variables to the squared partial correlation between variables. It ranged from 0 to 1. The results are put forth in table 6.5.

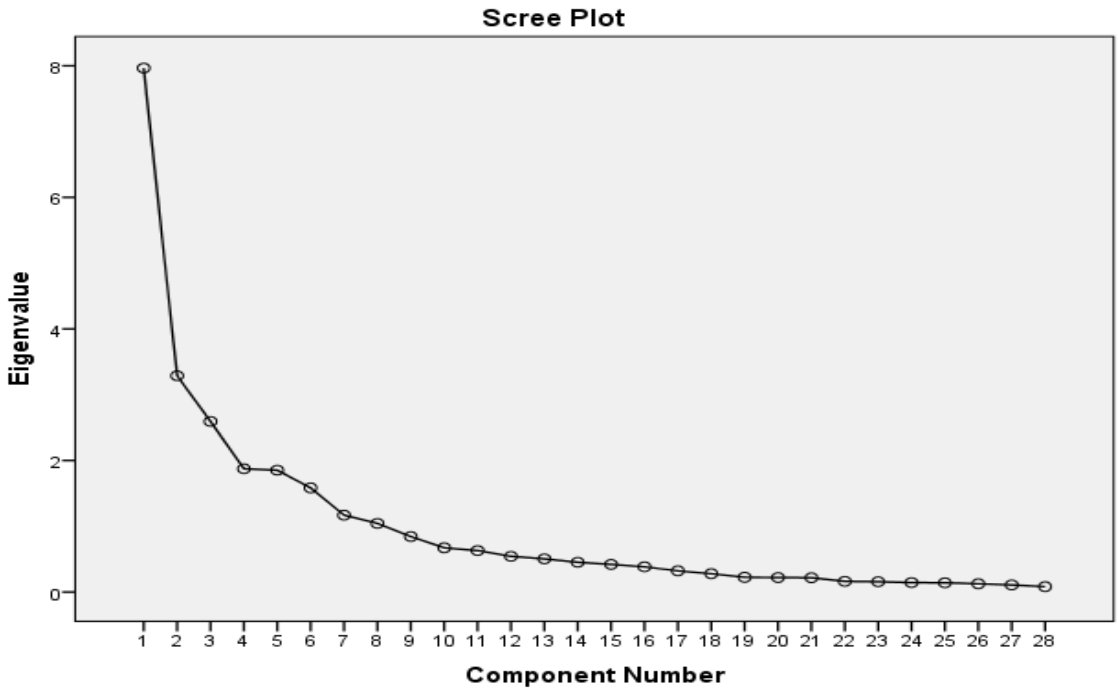
## Table 6.5
## KMO and Bartlett's Test

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .826 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 8346.501 |
| | Df | 378 |
| | Sig. | .000 |

Source: Primary Data

Bartlett's Test of Sphericity (significant level of p <0 .05) is used to confirm that the data set had patterned relationships. KMO test should be passed before conducting a Factor Analysis. Kaiser-Meyer-Olkin Measure of Sampling Adequacy varies between 0 and 1. The values closer to 1 are better. Here the value is 0.826 which is very high and hence the standard is met. Bartlett's Test of Sphericity was significant with chi-Square value = 8346.501, df= 378, p < 0.05 and hence the hypothesis was rejected. So, the inference is, the correlation matrix was no more identical and the study was conducive to the Factor Analysis.The Scree Plot of the factors is given in figure 6.1.

## Figure 6.1




Source: Primary Data

The Scree Plot determines the optimal number of components. It plots the eigen values of each component. The components which fall on the steep slope were extracted because the eigen values of those components were greater than 1.

Communalities indicate the amount of variance in each variable that is accounted for. Initial communalities are estimates of the variance in each variable accounted for by all components or factors. Extraction communalities are estimates of the variance in each variable accounted for by the factors (or components) in the factor solution. Small values indicate variables that do not fit well with the factor solution, and should possibly be dropped from the analysis.

**Table 6.6**
**Communalities**

| Statements | Initial | Extraction |
|---|---|---|
| $S_1$ | 1.000 | .792 |
| $S_2$ | 1.000 | .857 |
| $S_3$ | 1.000 | .775 |
| $S_4$ | 1.000 | .747 |
| $S_5$ | 1.000 | .652 |
| $S_6$ | 1.000 | .674 |
| $S_7$ | 1.000 | .721 |
| $S_8$ | 1.000 | .805 |
| $S_9$ | 1.000 | .746 |
| $S_{10}$ | 1.000 | .793 |
| $S_{11}$ | 1.000 | .823 |
| $S_{12}$ | 1.000 | .820 |
| $S_{13}$ | 1.000 | .791 |
| $S_{14}$ | 1.000 | .817 |
| $S_{15}$ | 1.000 | .823 |
| $S_{16}$ | 1.000 | .722 |
| $S_{17}$ | 1.000 | .767 |
| $S_{18}$ | 1.000 | .814 |
| $S_{19}$ | 1.000 | .774 |
| $S_{20}$ | 1.000 | .775 |
| $S_{21}$ | 1.000 | .746 |
| $S_{22}$ | 1.000 | .791 |
| $S_{23}$ | 1.000 | .818 |
| $S_{24}$ | 1.000 | .819 |
| $S_{25}$ | 1.000 | .768 |
| $S_{26}$ | 1.000 | .832 |
| $S_{27}$ | 1.000 | .839 |
| $S_{28}$ | 1.000 | .685 |
| Extraction Method: Principal Component Analysis. | | |

All the statements were retained in the analysis based on the communalities as they have high extraction values which is greater than 0.5

**Table 6.7**
**Total Variance Explained**

| Statements (Components) | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 8.850 | 31.606 | 31.606 | 8.850 | 31.606 | 31.606 |
| 2 | 3.264 | 11.656 | 43.262 | 3.264 | 11.656 | 43.262 |
| 3 | 2.453 | 8.762 | 52.024 | 2.453 | 8.762 | 52.024 |
| 4 | 1.909 | 6.818 | 58.841 | 1.909 | 6.818 | 58.841 |
| 5 | 1.610 | 5.750 | 64.591 | 1.610 | 5.750 | 64.591 |
| 6 | 1.516 | 5.414 | 70.005 | 1.516 | 5.414 | 70.005 |
| 7 | 1.113 | 3.974 | 73.979 | 1.113 | 3.974 | 73.979 |
| 8 | 1.071 | 3.825 | 77.804 | 1.071 | 3.825 | 77.804 |
| 9 | .783 | 2.795 | 80.599 | | | |
| 10 | .697 | 2.491 | 83.090 | | | |
| 11 | .562 | 2.006 | 85.096 | | | |
| 12 | .516 | 1.844 | 86.940 | | | |
| 13 | .465 | 1.659 | 88.599 | | | |
| 14 | .440 | 1.571 | 90.171 | | | |
| 15 | .400 | 1.429 | 91.600 | | | |
| 16 | .331 | 1.182 | 92.782 | | | |
| 17 | .281 | 1.003 | 93.784 | | | |
| 18 | .249 | .891 | 94.675 | | | |
| 19 | .225 | .802 | 95.477 | | | |
| 20 | .196 | .699 | 96.176 | | | |
| 21 | .175 | .627 | 96.803 | | | |
| 22 | .158 | .565 | 97.367 | | | |
| 23 | .158 | .563 | 97.931 | | | |
| 24 | .141 | .503 | 98.434 | | | |
| 25 | .135 | .484 | 98.917 | | | |
| 26 | .122 | .436 | 99.354 | | | |
| 27 | .102 | .364 | 99.718 | | | |
| 28 | .079 | .282 | 100.000 | | | |

Extraction Method: Principal Component Analysis, Source: Primary Data

Table 6.7 elucidated the actual factors that were extracted.As explained in section 2.2.3 (Theoretical Framework) of the study, 28 statements were used for the Factor Analysis. The result of the Factor Analysis statedthat 77.804 per cent of the variation in

the responses of 28 statements were reduced to eight factors having Eigen values greater than one using the standard procedure. Factor loadings were done through Orthogonal factor rotation method-Varimax.In Kaiser's Rule, eight factors which have Eigen values greater than unity were extracted from the data. Eigen values explained partitioning of the total variation contributed by each factor. Rotation is a method used to simplify interpretation of a factor analysis.

## Table 6.8

## Rotated Component Matrix

| Statements | Component | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| $S_1$ | .920 | | | | | | | |
| $S_2$ | .888 | | | | | | | |
| $S_3$ | .816 | | | | | | | |
| $S_4$ | .754 | | | | | | | |
| $S_5$ | .568 | .519 | | | | | | |
| $S_6$ | | .830 | | | | | | |
| $S_7$ | | .786 | | | | | | |
| $S_8$ | | .687 | | | | | | |
| $S_9$ | | .638 | | | | | | |
| $S_{10}$ | | | .832 | | | | | |
| $S_{11}$ | | | .802 | | | | | |
| $S_{12}$ | | | .743 | | | | | |
| $S_{13}$ | | | .668 | | | | | |
| $S_{14}$ | | | | .877 | | | | |
| $S_{15}$ | | | | .864 | | | | |
| $S_{16}$ | | | | .734 | | | | |
| $S_{17}$ | | | | | .887 | | | |
| $S_{18}$ | | | | | .852 | | | |
| $S_{19}$ | | | | | .763 | | | |
| $S_{20}$ | | | | | | .825 | | |
| $S_{21}$ | | | | | | .772 | | |
| $S_{22}$ | | | | | | .703 | | |
| $S_{23}$ | | | | | | | .806 | |
| $S_{24}$ | | | | | | | .754 | |
| $S_{25}$ | | | | | | | .642 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $S_{26}$ | | | | | | | | .827 |
| $S_{27}$ | | | | | | | | .692 |
| $S_{28}$ | | | | | | | | .571 |
| Extraction Method: Principal Component Analysis.<br>Rotation Method: Varimax with Kaiser Normalization.[a] | | | | | | | | |
| a. Rotation converged in 9 iterations. | | | | | | | | |

($S_1$ –$S_{28}$ are the 28 statements used in the study)

Source: Primary Data

Table 6.8 explicated that there was much rotation in the variables.In table 6.8, the variables having high loadings are narrated. These variables were organized based on their loadings. Eight factors which had high factor loadings were having significant impact on employed engineering graduates' employability. Here factors preventing from moving to a new area in search of alternative employability were analyzed using a seven point scale measuring instrument with 28 statements. Further, statements were reduced based on the communalities in the extraction. The responses were analysed with factor analysis which resulted in the following factors. Based on the common factors seen in each group, appropriate names were given after discussion with experts.

### 6.6.2 New Factors of the Model

The factors were named as follows:

Factor 1-Career Development Learning

Factor-2 Subject Knowledge and Experience

Factor-3 Capability of Engineering Graduates

Factor 4: Intuition and time allocation

Factor 5- Emotional Intelligence

Factor 6- Self –Confidence

Factor 7 - Comprehensive behavior

Factor 8 – Innovation

### 6.6.2.1 Factor 1-Career Development Learning

The first important factor affecting employability of engineering graduates is Career Development Learning. Career development is the lifetime method of handling learning, work, leisure and transitions in order to change a personally determined and evolving preferred future. It increases employee's motivation and productivity. A discussion with employed engineering graduates regarding factors affecting employability assures "I discern about what is the required factor for me to successfully sort of job I want to do" this statement gave highest factor loadings (0.920). The second factor loading statement from this factor is "I know what kind of work would outfit my personality" (0.888).The next factor loading factor was " After my graduation I know what I want to do " (0.816) and the fourth factor loading from the Career Development Learning factor was "I am familiar with where to find out information about the employment that interest me"(0.754). And the last factor loading from this factor was "Apart from money, I Know what I want from my working life (0.568)".

The study found out that employed engineering graduates gave importance to the statements given in table 6.9. The Factor loading of the first factor is given in Table 6.9.

**Table 6.9**

**Factor 1: Career Development Learning**

| Variable | Factor Loadings |
|---|---|
| I discern about what is required factor for me successfully sort of job I want to do | 0.920 |
| I know what kind of work would outfit my personality | 0.888 |
| After my graduation I know what I want to do | 0.816 |
| I have familiar with where to find out information about the employment that interest me | 0.754 |
| Apart from money, I Know what I want from my working Life. | 0.568 |

Source: Primary Data

Table 6.9 puts forth that highest factor loading is recorded to Career Development and Learning (CDL). The second factor loading (0.888) is accorded to the statement "I know what kind of work would outfit my personality". In Kerala engineering graduates give importance to their work and their personality. If they know the type of job they are going to take up, they would prepare their personality for the newly assigned job. Every person outfits a personality and adjusts their personality with the job. It helpsthe employees to work effectively in their institutions. The next factor loading was accorded to the statement "I am familiar with where to find out information about the employment that interests me". After engineering graduation, every engineering graduate must find out the employment for which they are interested. It states that every individual must know the career suites them. Next highest factor loading was assigned to the statement "Apart from money, I Know what I want from my working Life". It explains that money is not an important concern but everyone knows the satisfaction they get from their professional life. The descriptive statistics on this factor is given in table 6.10.

## Table 6.10

## Descriptive Statistics

| | | | Statistic | Std. Error |
|---|---|---|---|---|
| CDL | Mean | | 23.3640 | .27149 |
| | 95% Confidence Interval for Mean | Lower Bound | 22.8306 | |
| | | Upper Bound | 23.8974 | |
| | 5% Trimmed Mean | | 23.4378 | |
| | Median | | 23.0000 | |
| | Variance | | 36.853 | |
| | Std. Deviation | | 6.07068 | |
| | Minimum | | 5.00 | |
| | Maximum | | 35.00 | |
| | Range | | 30.00 | |
| | Interquartile Range | | 9.00 | |
| | Skewness | | -.127 | .109 |
| | Kurtosis | | -.674 | .218 |

Source: Primary Data

Table 6.10 displays that the total variance was 36.853, mean was 23.364, and standard deviation was 6.07. The standard error of the mean was 0.271. The study brings out that Career Development Learning is one of the important factors to affect the employability.

### 6.6.2.2 Factor-2 Subject Knowledge and Experience

The second important factor is Subject Knowledge and Experience and it shows theknowledge the graduates have gained from the subject they studied and the experience they acquired from their job. Subject knowledge and experience of work was essential in employed engineering graduates. Subject knowledge means information of the person expected to learn in a given subject. It helps them to achieve a good position in their job. Experience of work means one of the experiences that a person gains while working in specific field or Occupation. It is very essential to get an employment. Factor loadings were given in table 6.11.

**Table 6.11**

**Factor 2:Subject Knowledge and Experience**

| Variable | Factor Loadings |
|---|---|
| I am satisfied with academic performance | 0.830 |
| I can explain the value of my experience to a potential employer | 0.786 |
| I have lot of work experience | 0.687 |
| My academic performance so far is in line with my career aspirations | 0.638 |

Source: Primary Data

Table 6.11 elucidates that four variables help to make employment effective. Every employee desires to gain experience from their work and attain knowledge or information. In the subject knowledge, highest factor loadings (0.830) were assigned to the statement “I am satisfied with academic performance”. The engineering graduates were admitted in the branch of study that they were satisfied with and they were happy with their performance.Academic performance has a prominent role in getting employed.The next factor loading (0.786) was assigned to the statement “ I can explain the value of my

experience to a potential employer". This elucidated that experience of work is an important element in the interviews of job. Value of experience is an attractive factor to the potential employer. The next factor loading (0.687) was for the statement "I have lot of work experience." This explains that every worker must discern about their work experience. It will lead to attain good salary or promotions. The last factor loadings was for the statement "My academic performance so far is in line with my career aspirations" (0.638). This statement clarifies that each employee must give importance to their academic performance and it will help to attain the ambitioned career on their own. Table 6.12 explains the descriptive statistics.

## Table 6.12

## Descriptive Statistics

| | | | Statistic | Std. Error |
|---|---|---|---|---|
| SKE | Mean | | 22.1720 | .20091 |
| | 95% Confidence Interval for Mean | Lower Bound | 21.7773 | |
| | | Upper Bound | 22.5667 | |
| | 5% Trimmed Mean | | 22.4044 | |
| | Median | | 23.0000 | |
| | Variance | | 20.183 | |
| | Std. Deviation | | 4.49253 | |
| | Minimum | | 7.00 | |
| | Maximum | | 49.00 | |
| | Range | | 42.00 | |
| | Interquartile Range | | 6.00 | |
| | Skewness | | -.432 | .109 |
| | Kurtosis | | 2.584 | .218 |

Source: Primary Data

This table 6.12 narrates that total variance was 20.183, mean was 22.172, and standard deviation was 4.49. The standard error of the mean was 0.2009. The study observed that Subject Knowledge and Experience was an important factor to affect the employability of engineering graduates in Kerala.

### 6.6.2.3 Factor-3 Capability of Engineering Graduates

The third factor affecting the employability of engineering degree holders is Capability of Engineering Graduates. Being capable means that the person is able to make things work, he or she is responsible for it to be implemented in the practical life. The factor loadings are put forth in table 6.13.

**Table 6.13**

**Factor 3: Capability of Engineering Graduates**

| Variable | Factor Loadings |
|---|---|
| I am good at making presentations | 0.832 |
| I am confident to my writing communication skill | 0.802 |
| I have good oral communication skill | 0.743 |
| I work well in a team | 0.668 |

Source: Primary Data

Table 6.13 reveals that in the statement analysed, four variables are linked tothe skill formation. The respondents believed that skill development was gained through graduation and it would help to get employed. The first statement got the highest factor loadings from this factor (Capability of Engineering Graduates). The statement was “I am good at making presentations” (0.832). This displays that the skill levels of graduates of engineering. Making presentation was good in employment and it had highest factor loading. It is one of the capabilities of engineering graduates. The second factor loading (0.802) statement of this factor was “I am confident of my writing and communication

skill". After graduation, many students captured different skill levels and their confidence level on written communication skill was increasing. Another statement that has attained the next factor loadings (0.742) was "I have good oral communication skill". This narrates that oral communication is an important element in employment. It will help to get the attention of the employer of the institution and it will lead to promotion facilities or increase the salary of employees. The next factor loading was given to "I work well in a team" (0.668). This statement helps to achieve good team management skill. With good team management skill the engineering graduates can support well the progress of the company, they work. The descriptive statistics on this factor is brought forth in table 6.14.

## Table 6.14

## Descriptive Statistics

| | | | Statistic | Std. Error |
|---|---|---|---|---|
| **CEG** | **Mean** | | **23.5520** | **.16945** |
| | 95% Confidence Interval for Mean | Lower Bound | 23.2191 | |
| | | Upper Bound | 23.8849 | |
| | 5% Trimmed Mean | | 23.8689 | |
| | Median | | 24.0000 | |
| | Variance | | 14.356 | |
| | Std. Deviation | | 3.78893 | |
| | Minimum | | 10.00 | |
| | Maximum | | 28.00 | |
| | Range | | 18.00 | |
| | Interquartile Range | | 4.00 | |
| | Skewness | | -1.132 | .109 |
| | Kurtosis | | .923 | .218 |

Table 6.14 specifies that mean of factor three is 23.55 and variance 14.356 and the standard deviation is 3.78. Each row of the table displays the measures of central tendency and dispersion of variables. This brought out the values of central tendency and dispersion of the element.

### 6.6.2.4 Factor 4-Intuition and time allocation

Factor four focuses on the need of allocating the time well. Intuition means a process that gives the ability to know something directly without analytic reasoning and bridging gap between the conscious and unconscious parts of mind. In our study, the factor "Intuition and Time Allocation" has a significant role in determining the employability of engineering graduates. It is observed that in the study this factor was not the most decisive factor to affect the employability. Table 6.15, explains factor four.

**Table 6.15**
**Factor 4: Intuition and Time Allocation**

| Variable | Factor Loadings |
|---|---|
| I work well independently | 0.877 |
| I have good time management skill | 0.864 |
| I am good at solving problems | 0.734 |

Source:Primary Data

The three components mentioned in table 6.15 are essential to create a good working environment. The factor loading was (0.877) and the statement was "I work well independently". It exposition that every worker wanted to work independently. Freedom gives a better working environment. Another important factor loading statement was "I have good time management skill" (0.864). This indicates that time management skill was important for a systematic and disciplined working atmosphere. The last factor loading from this factor was "I am good at solving problems" (0.734). It is important in everyday life. Problem solving is a skill that helps the employee to be mature individuals to carry out the duties entrusted to him or her well.

**Table 6.16**
**Descriptive Statistics**

| | | | Statistic | Std. Error |
|---|---|---|---|---|
| ITA | Mean | | 17.1000 | .13458 |
| | 95% Confidence Interval for Mean | Lower Bound | 16.8356 | |
| | | Upper Bound | 17.3644 | |
| | 5% Trimmed Mean | | 17.3200 | |
| | Median | | 17.5000 | |
| | Variance | | 9.056 | |
| | Std. Deviation | | 3.00934 | |

| | | | |
|---|---|---|---|
| | Minimum | 4.00 | |
| | Maximum | 21.00 | |
| | Range | 17.00 | |
| | Interquartile Range | 4.00 | |
| | Skewness | -.910 | .109 |
| | Kurtosis | 1.017 | .218 |

Source: Primary Data

Table 6.16 elucidates that total variance was 9.056, mean was 17.10, and standard deviation was 3.009. The standard error of the mean was 0.134.

### 6.6.2.5 Factor 5- Emotional Intelligence

Emotional Intelligence is another important factor that affects the employability of engineering graduates. This factor explains how people perceive, understand and manage emotion and feelings of oneself and others. It helps to be aware of those feelings and manage them effectively. Emotional intelligence helps them to solve difficulties which they experience in their personal relationships and their professional relationships with colleagues, managers and customers. Therefore it is important to make engineering graduates conscious of this and help them to develop their ability in this area. The factor loadings was given in table 6.17:

**Table 6.17**
**Factor 5:Emotional Intelligence**

| Variable | Factor Loadings |
|---|---|
| I am good at working out what other people are feeling | 0.887 |
| I am able to manage my emotions effectively | 0.852 |
| I am good at knowing how I am feeling at a given time | 0.763 |

Source:Primary Data

Table 6.17 shows the variables of emotional intelligence. Table 6.17 explains that respondents were more concentrated on this factor than other factors. Every person has emotional feelings .The highest factor loading (0.887) from this factor. The statement was "I am good at working out what other people are feeling".This make clear that every worker has his or her own emotions. The engineers expressed that they were more conscious on what others thought and felt about them. The next factor loading (0.852)

statement was “I am able to manage my emotions effectively”. Every individual has their own emotions. In work place, the emotions often burst out in different forms. If an employee is very sad because of some reason or other, he has to manage his or her emotions and work well on that day. This helps to understood that emotions should be managed effectively . The last factor loading (0.763) statement from this factor was “I am good at knowing how I am feeling at a given time”. This describes that each graduate knows his or her feeling well. This model of employability is the model that takes into consideration the factor emotion.

**Table 6.18**
**Descriptive Statistics**

| | | | Statistic | Std. Error |
|---|---|---|---|---|
| EI | Mean | | 18.1140 | .13202 |
| | 95% Confidence Interval for Mean | Lower Bound | 17.8546 | |
| | | Upper Bound | 18.3734 | |
| | 5% Trimmed Mean | | 18.4178 | |
| | Median | | 19.0000 | |
| | Variance | | 8.714 | |
| | Std. Deviation | | 2.95202 | |
| | Minimum | | 6.00 | |
| | Maximum | | 21.00 | |
| | Range | | 15.00 | |
| | Interquartile Range | | 3.75 | |
| | Skewness | | -1.401 | .109 |
| | Kurtosis | | 1.974 | .218 |

Source: Primary Data

Table 6.18 stipulates that mean of the factor was 18.114, variance was 8.714 and the standard deviation was 2.952. The range of emotional intelligence was 15.

### 6.6.2.6 Factor 6- Self –Confidence

Another factor to affect the employability was self-confidence. It is self- guarantee in one’s personal judgment, ability and power. It was influenced by factors like atmosphere of employment and levels of dedication towards pursuing a cause. It helps to believe in oneself. The main factor loading variables are given in table 6.19.

## Table 6.19
## Factor 6: Self –Confidence

| Variable | Factor Loadings |
|---|---|
| I am confident to use IT | 0.825 |
| I satisfied with my level of numeracy | 0.772 |
| I have good planning& organizational skill | 0.703 |

Source:Primary Data

The statements given in table 6.19, helped to improve the self-confidence of the respondents. It had helped them to get a good employment. Factor loadings indicated that every respondent in this study gave importance to these statements. The highest factor loading statement from this factor was "I am confident to use IT"(0.825). In modern technical world, information technologies have uppermost prominence. Every employee needs to use IT in modern world. It helps to increase the productivity of the institution. The next factor loading (0.772) statement was"I satisfied with my level of numeracy". Numerical ability of the individual helps to achieve a good job. The last factor loading statement was "I have good planning and organizational skill"(0.703). This narrated that each worker had their own planning and organization skill. The descriptive statistics of the factor 'Self-Confidence' is given in table 6.20

## Table 6.20
## Descriptive Statistics

| | | | Statistic | Std. Error |
|---|---|---|---|---|
| SC | Mean | | 17.8020 | .12373 |
| | 95% Confidence Interval for Mean | Lower Bound | 17.5589 | |
| | | Upper Bound | 18.0451 | |
| | 5% Trimmed Mean | | 18.0356 | |
| | Median | | 18.0000 | |
| | Variance | | 7.654 | |
| | Std. Deviation | | 2.76661 | |
| | Minimum | | 5.00 | |

| | | | |
|---|---|---|---|
| | Maximum | 21.00 | |
| | Range | 16.00 | |
| | Interquartile Range | 4.00 | |
| | Skewness | -1.153 | .109 |
| | Kurtosis | 1.515 | .218 |

Source: Primary Data

Table 6.20 states that mean of this factor was 17.80, variance was 7.654 and the standard deviation was 2.766.

### 6.6.2.7 Factor 7 –Comprehensive Behaviour

Comprehensive Behaviour is another factor that affects the employability. This factor was helpful to know the overall knowledge of the engineering graduates. It helps to know the complete pictures of their nature. The employers were enthusiastic to appreciate the employees and the innovations of their work.

**Table 6.21**

**Factor 7: Comprehensive Behaviour**

| Variable | Factor Loadings |
|---|---|
| I am able to adjust easily to new situation | 0.806 |
| I have good understanding on how business operate | 0.754 |
| I am good at coming up with new ideas | 0.642 |

Source: Primary Data

Comprehensive Behaviour of the respondent is a crucial factor in working place. The general beliefis that every person adjuststo new situations of the work place. The survey discloses that comprehensive behaviour is an essential factor in employment of a person. The highest factor loading statement (0.806) was “I am able to adjust easily to new situation”. It denotes that every worker must adjust easily in new situation. This helps

the worker to attain a good position. The next factor loading (0.754) statement was “I have good understanding on how business operate”. This statement explains the capability of the employee to contribute to the profit of the company. The last factor loading statement (0.642) was “I am good at coming up with new ideas”. Every graduate who are employed person that have known about good at new ideas.

**Table 6.22**

**Descriptive Statistics**

| | | | Statistic | Std. Error |
|---|---|---|---|---|
| CB | Mean | | 17.5040 | .13363 |
| | 95% Confidence Interval for Mean | Lower Bound | 17.2415 | |
| | | Upper Bound | 17.7665 | |
| | 5% Trimmed Mean | | 17.7400 | |
| | Median | | 18.0000 | |
| | Variance | | 8.928 | |
| | Std. Deviation | | 2.98795 | |
| | Minimum | | 4.00 | |
| | Maximum | | 21.00 | |
| | Range | | 17.00 | |
| | Interquartile Range | | 4.00 | |
| | Skewness | | -1.047 | .109 |
| | Kurtosis | | .971 | .218 |

Source: Primary Data

Table 6.22 displays that total variance was 8.928, mean was 17.504, and standard deviation was 2.987. The standard error of the mean was 0.1336 .

### 6.6.2.8 Factor 8 – Innovation

The last factor affecting the employability of employed engineering graduates was innovation. It is a process of making a new idea that creates value. The results of new ideas are accepted and they satisfy the need and expectation of employers. Creativity is the nature of generating a new idea, concept or method. Innovation uses creativity to enhancethe performance of a process, person, team or organization.

## Table 6.23
## Factor 8: Innovation

| Variable | Factor Loadings |
|---|---|
| I can pay attention to detail when necessary | 0.827 |
| I am good at coming up with new ideas | 0.692 |
| I am always open to new ideas | 0.571 |

Source: Primary Data

Table 6.23 demonstrates that each variable from the factorInnovation is got importance in the survey. Employed persons create new ideas and they use them in when necessary situations. The highest factor loading (0.827) statement was “I can pay attention to detail when necessary”. If a necessary situation of employment, the employees have to give attention to the situation. The next factor loading statement was (0.692) “I am good at coming up with new ideas”. Every worker has to have new ideas about his or her job. This will help him or her to attain good position in their career. The last factor loading statement was “I am always open to new ideas”. This will help to accept new idea in their work.

## Table 6.24

## Descriptive Statistics

| | | | Statistic | Std. Error |
|---|---|---|---|---|
| Innovation | Mean | | 17.8780 | .12961 |
| | 95% Confidence Interval for Mean | Lower Bound | 17.6233 | |
| | | Upper Bound | 18.1327 | |
| | 5% Trimmed Mean | | 18.1422 | |
| | Median | | 19.0000 | |
| | Variance | | 8.400 | |
| | Std. Deviation | | 2.89826 | |
| | Minimum | | 8.00 | |
| | Maximum | | 21.00 | |
| | Range | | 13.00 | |
| | Interquartile Range | | 3.00 | |
| | Skewness | | -1.268 | .109 |
| | Kurtosis | | 1.234 | .218 |

Source: Primary Data

Table 6.24 presents that total variance was 8.40, mean was 17.87, and standard deviation was 2.89. The standard error of the mean was 0.1296.

### 6.6.3 Conclusion of Factor Analysis

The factor analysis had identified eight factors which had significant impact onthe employability of employed engineering graduates in Kerala. Among the eight factors, Career Development Learning was the most important as far as the employability of engineering graduates was concerned.

The factor analysis gave emphasis to the Career Development Learning as the most loaded factor which had the factor loading as 0.920, 0.888, 0.816, 0.754 and 0.568 respectively. This reveals that the most imperative reason which deters the employability of engineering graduates is Career Development Learning. As mentioned in the section (6.6.2.1) on Career Development Learning, employment related statements like "which is the required factor for me successfully sort of job I want to do" is much relevant in modern engineering graduates. The second variable was "what kind of work would outfit respondent's personality". It clearly specified the personal awareness of their capacity to work in the particular field to find good job. The third variable was "after graduation, what do you want to do". It explains assessment of the knowledge of the graduate. The next variable was "I am familiar with where to find out information about the employment that interests me". It discloses the idea of familiarity of the job that interests them. The last variable was "Apart from money, I Know what I want from my working Life". It shows that they have given more importance to work than money. This should be an eye opener to the whole of working people. In the second factor the highest factor loading was Subject Knowledge and Experience. In a career or job, the knowledge of their subject is very significant.

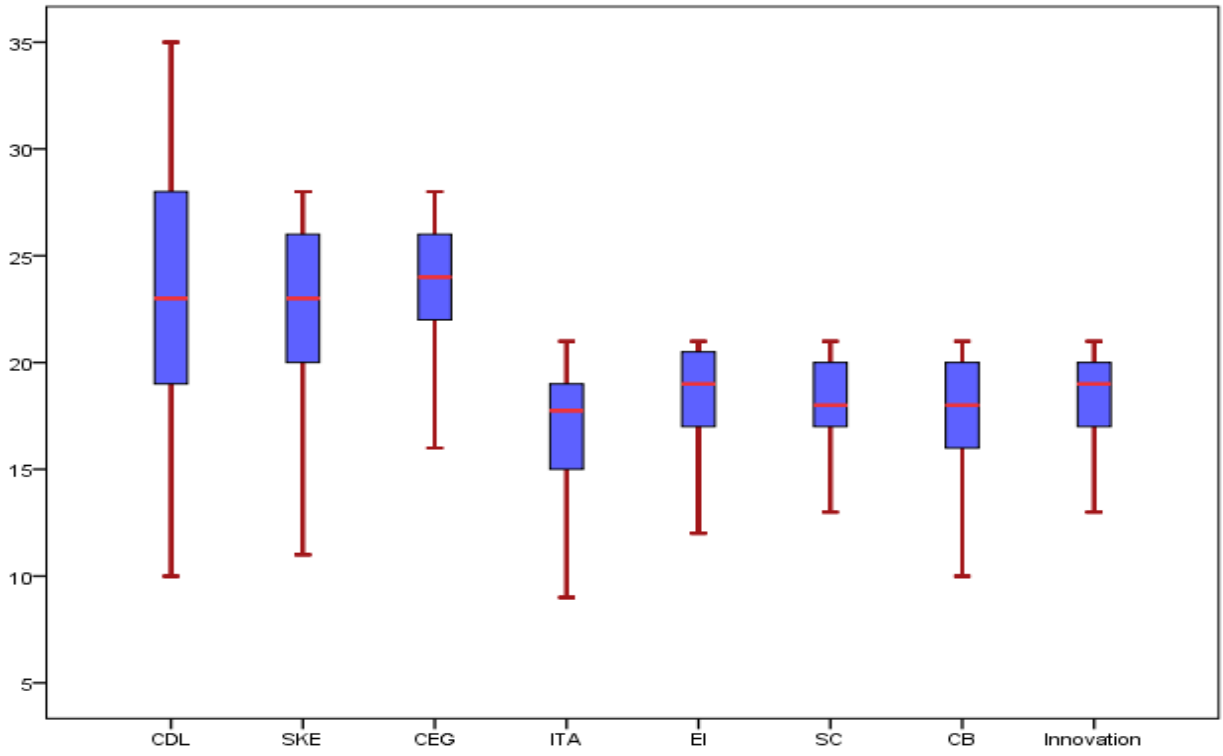
## 6.7 Results of Independent Sample t- Test and ANOVA

Before discussing the results of Independent Sample t-Test and the eight factors derived out of ANOVA of the factor analysis, a boxplot is done based on the factors considered. The eight factors are Career Development Learning, Subject Knowledge and Experience ,Capability of Engineering Graduates, Intuition and Time Allocation, Emotional Intelligence, Self-Confidence, Comprehensive Behaviour and Innovation. A box plot is a

graphical rendition of statistical data based on the five number summary (minimum, first quartile, median, third quartile and maximum). It is used for explanatory data analysis.

**Figure 6.2**

**Boxplot**




Source:Primary Data

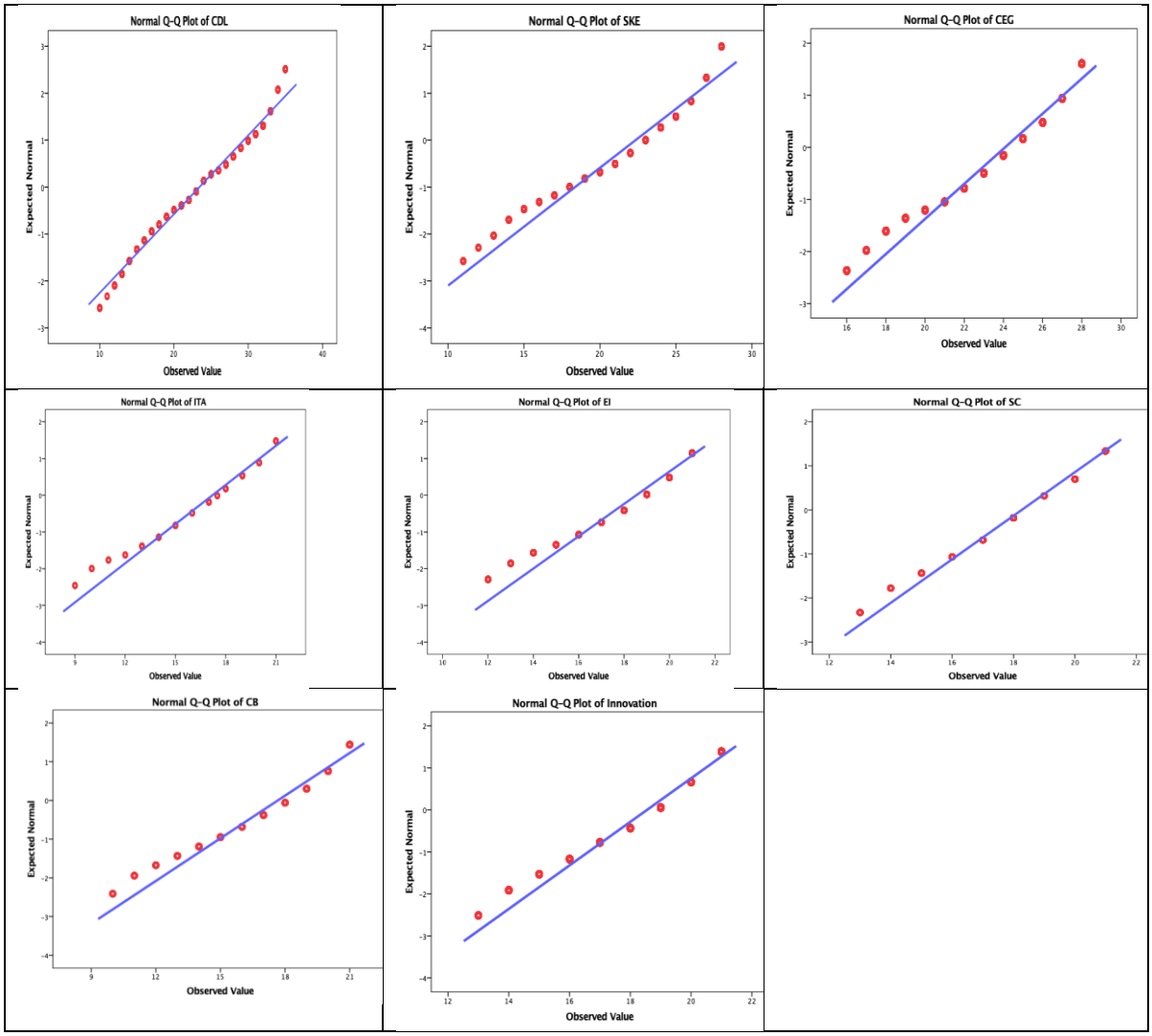
Figure 6.2 illustrates the variability of eight factors among employed engineering graduates. The red line in the middle of the boxes is the median of employability. Boxplots compares measures of data efficiently. So the present study we have resorted to Boxplot.

### 6.7.1 Q-Q Plot

Q-Q plots were used to graphically examine the sample distribution. It is a scatterplot created by plotting two sets of quantiles against one another. If both sets of quantiles came from the same distribution, it should be treated as normal. The eight factors Q-Q plots are given figure 6.3.

## Figure 6.3

## Q-Q plot




Source:Primary Data

Figure 6.3 expositions the q-q plot of factors in employability. If the points are close to or exactly on the line, then distribution is said to be normal. Here, the points are not much away from the line. There is normal q-q plot in each factor. It displays that normality of each factor . This is the justification on which the parametric test was applied in the study.

### 6.7.2 Descriptive Statistics

The statistics of the employability shows the mean values and standard deviation of the model factors. Eight factors were extracted after rotated Factor Analysis.

## Table 6.25
## Descriptive Statistics

| Statistics | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | CDL | SKE | CEG | ITA | EI | SC | CB | Innovation |
| N | Valid | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| | Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | | 23.43 | 22.34 | 24.08 | 17.20 | 18.53 | 18.26 | 17.66 | 18.54 |
| Std. Deviation | | 5.95 | 3.983 | 2.970 | 2.814 | 2.272 | 2.023 | 2.723 | 1.92 |
| Range | | 25.00 | 17.00 | 12.00 | 12.00 | 9.00 | 8.00 | 11.00 | 8.00 |
| Minimum | | 10.00 | 11.00 | 16.00 | 9.00 | 12.00 | 13.00 | 10.00 | 13.00 |
| Maximum | | 35.00 | 28.00 | 28.00 | 21.00 | 21.00 | 21.00 | 21.00 | 21.00 |

Source: Primary Data

The descriptive analysis gives mean of each factor. The first one was Career Development Learning (CDL). The mean value of CDL was 23.43 and standard deviation was 5.95 that means it is included in high segment level. The next factor was Subject Knowledge and Experience (SKE). The mean value was 22.34 and standard deviation was 3.983.This explains that SKE was included in very high segment level. Another factor was Capability of Engineering Graduates (CEG). The mean value of CEG was 24.08 and standard deviation was 2.97.This means that this factor also has very high segment level. The next was Intuition and Time Allocation (ITA). The mean value was 17.20 and standard deviation was 2.814. The study observed that the mean value stood very high segment level. Emotional Intelligence (EI) was another factor. The mean value was 18.53 and standard deviation was 2.272. The mean value of this factor was at a very high level. The next factor is Self-Confidence (SC). The mean value of SC was 18.26 and standard deviation was 2.023. It had high level segment factor. Another factor was Comprehensive Behaviour (CB). The mean value of CB was 17.66 and standard deviation was 2.723 which stood at a very highsegment level. The last factor was Innovation. The mean value was 18.54 and standard deviation was 1.92, as such it also stood at a very highsegmentlevel which tells that Career Development Learning was the most important factor that determines the employability of an engineering graduate. Table 6.25 clearly explains the measurement of each factor of employability.

### 6.7.3 Gender wise Group Statistics

In the present study, gender wise categorization, deals with the factors affecting employability of men and women. The study specifically explains the factors which determined the employability of women in comparison with their counterparts. Table 6.27 illustrates that two groups i.e. first group (male) and second group (female) the mean for male is statistically significant than the mean for female. Two groups were measured together.

**Table 6.26**
**Group Statistics**

| Group Statistics | | | | | |
|---|---|---|---|---|---|
| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
| CDL | Male | 340 | 23.4471 | 5.91035 | .32053 |
| | Female | 160 | 23.4125 | 6.07644 | .48038 |
| SKE | Male | 340 | 22.4206 | 3.88661 | .21078 |
| | Female | 160 | 22.1875 | 4.18922 | .33119 |
| CEG | Male | 340 | 24.0500 | 2.89856 | .15720 |
| | Female | 160 | 24.1500 | 3.12466 | .24703 |
| ITA | Male | 340 | 17.0368 | 2.83014 | .15349 |
| | Female | 160 | 17.5750 | 2.75247 | .21760 |
| EI | Male | 340 | 18.5765 | 2.17047 | .11771 |
| | Female | 160 | 18.4438 | 2.47947 | .19602 |
| SC | Male | 340 | 18.2059 | 2.04636 | .11098 |
| | Female | 160 | 18.3938 | 1.97499 | .15614 |
| CB | Male | 340 | 17.6882 | 2.74639 | .14894 |
| | Female | 160 | 17.6125 | 2.68231 | .21206 |
| Innovation | Male | 340 | 18.4529 | 1.93877 | .10514 |
| | Female | 160 | 18.7500 | 1.90002 | .15021 |

Source: Primary Data

Table 6.26 illustrates the differences in male and female score value. Table 6.27 narrates that Career Development Learning score was slightly higher in male than female. The mean value of Career Development Learning of male and female show that male score value was more than female. The standard deviation of male was 5.91 and for female it was 6.07. The next variable was Subject Knowledge and Experience and the score value was also higher for male than female. The mean value of male was 22.42 and female was 22.18. The Capability of Engineering Graduates was another factor. Its score value was higher in female than male. It shows that capability means skill development of graduates.

The study brought out that female has slightly high capability than male for skill formation. The average (mean) value of capability for men was 24.05 and women was 24.15. Another factor was Intuition and Time Allocation. Its score value was slightly higher for female than male. The mean value of male was 17.03 and female was 17.57. The other factor was Emotional Intelligence and score value was higher for male (18.57) than female (18.44). This explained that employability was higher in Self-Confidence's score value of male than female. The next variable Comprehensive Behaviour's score value was higher for male than female. The mean value of Comprehensive Behaviour for male was 17.68 and female was 17.61. The last factor was Innovation . The score vale was slightly higher in male (18.45) than female (18.75).

The Independent Samples t -Test compares the means of two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different.

**Table 6.27**
**Independent Samples Test**

| | | t-test for Equality of Means | | |
|---|---|---|---|---|
| | | t | df | Sig. (2-tailed) |
| CDL | Equal variances assumed | .060 | 498 | .952 |
| | Equal variances not assumed | .060 | 303.847 | .952 |
| SKE | Equal variances assumed | .610 | 498 | .542 |
| | Equal variances not assumed | .594 | 291.467 | .553 |
| CEG | Equal variances assumed | -.351 | 498 | .726 |
| | Equal variances not assumed | -.342 | 291.432 | .733 |
| ITA | Equal variances assumed | -2.001 | 498 | .046 |
| | Equal variances not assumed | -2.021 | 319.478 | .044 |
| EI | Equal variances assumed | .609 | 498 | .543 |
| | Equal variances not assumed | .580 | 277.428 | .562 |
| SC | Equal variances assumed | -.968 | 498 | .333 |
| | Equal variances not assumed | -.981 | 321.725 | .327 |
| CB | Equal variances assumed | .290 | 498 | .772 |
| | Equal variances not assumed | .292 | 318.250 | .770 |
| Innovation | Equal variances assumed | -1.608 | 498 | .108 |
| | Equal variances not assumed | -1.620 | 317.262 | .106 |

Source:Primary Data

The p-value of the Career Development Learning is .952, which is larger than .05 but the factor Subject Knowledge and Experience is .542, it was slightly more than .05. Another factor Capability of Engineering Graduate's p-value was .726 which was higher than .05, Intuition and Time Allocation factor's p-value was .046, it is slightly lower than .05, Emotional Intelligence's p-value was .543 it is higher than .05, Self-Confidence p-value was .333 it is higher than .05,Comprehensive Behaviour's p-value is .772 and it is more than .05, and the last factor Innovation's p-value was .108 and it is greater than .05. This reveals that there is no statistically significant differences between factors of the employability model and gender. This variable does not vary according to gender.

### 6.7.3.1 The Result of the 4th Hypothesis

The fourth hypothesis of the study stated that the variables such as the differences of gender and factors of employability of engineering graduates did not have any relationship. The statistical tool used to analyse the hypothesis was Independent Samples t-Test which brought out the finding that there was no statistically significant differences between factors of the model of employability and gender. The factors affecting employability were eight in number and the most important one was 'Career Development and Learning' (explained in section 6.6.2.1).The result explains that whether male or female the factors affecting their employability were the same. Thus the study accepts the hypothesis.

## 6.7.4 District Wise Group Statistics

The present section deals with district wise analysis. Group statistics displays the summary of the measures of the mean, standard deviation and standard error. The group statistics is explained in table 6.28.

## Table 6.28

## Group Statistics

| | District | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| CDL | Ernakulam | 251 | 23.3865 | 6.02777 | .38047 |
| | Thiruvananthapuram | 249 | 23.4859 | 5.89840 | .37380 |
| SKE | Ernakulam | 251 | 22.6534 | 3.86618 | .24403 |
| | Thiruvananthapuram | 249 | 22.0361 | 4.08216 | .25870 |
| CEG | Ernakulam | 251 | 24.1952 | 2.98760 | .18858 |
| | Thiruvananthapuram | 249 | 23.9679 | 2.95377 | .18719 |
| ITA | Ernakulam | 251 | 17.4024 | 2.82444 | .17828 |
| | Thiruvananthapuram | 249 | 17.0141 | 2.79559 | .17716 |
| EI | Ernakulam | 251 | 18.4900 | 2.29846 | .14508 |
| | Thiruvananthapuram | 249 | 18.5783 | 2.24930 | .14254 |
| SC | Ernakulam | 251 | 18.4781 | 1.95000 | .12308 |
| | Thiruvananthapuram | 249 | 18.0522 | 2.07745 | .13165 |
| CB | Ernakulam | 251 | 17.7530 | 2.67932 | .16912 |
| | Thiruvananthapuram | 249 | 17.5743 | 2.77000 | .17554 |
| Innovation | Ernakulam | 251 | 18.5498 | 1.94127 | .12253 |
| | Thiruvananthapuram | 249 | 18.5462 | 1.92157 | .12177 |

Source:Primary Data

Table 6.28 elucidates the differences inscore value of the sample districts. The table specifies that Career Development and Learning score (23.48) was slightly higher in Thiruvananthapuram than Ernakulam (23.38). The next variable Subject Knowledge and Experience score was also higher in Ernakulam. The mean value of Ernakulam was 22.65 and Thiruvananthapuram was 22.03. The Capability of Engineering Graduates was another factor. Its score value was higher in Ernakulam. Another factor was Intuition and Time Alloction. The score value was slightly higher in Ernakulam. The other factor was Emotional Intelligence and the score value was higher in Thiruvananthapuram than Ernakulam. Self-confidence's score value was higher in Ernakulam. For the variable Comprehensive Behaviour the score value was higher in Ernakulam. The last factor was Innovation. Its score value was slightly higher in Ernakulam than in Thiruvananthapuram. The statistical significance is given in table 6.29.

**Table 6.29**
**Independent Samples Test**

| | | t-test for Equality of Means | | |
|---|---|---|---|---|
| | | t | df | Sig. (2-tailed) |
| CDL | Equal variances assumed | .060 | 498 | .952 |
| | Equal variances not assumed | .060 | 303.847 | .952 |
| SKE | Equal variances assumed | .610 | 498 | .542 |
| | Equal variances not assumed | .594 | 291.467 | .553 |
| CEG | Equal variances assumed | -.351 | 498 | .726 |
| | Equal variances not assumed | -.342 | 291.432 | .733 |
| ITA | Equal variances assumed | -2.001 | 498 | .046 |
| | Equal variances not assumed | -2.021 | 319.478 | .044 |
| EI | Equal variances assumed | .609 | 498 | .543 |
| | Equal variances not assumed | .580 | 277.428 | .562 |
| SC | Equal variances assumed | -.968 | 498 | .333 |
| | Equal variances not assumed | -.981 | 321.725 | .327 |
| CB | Equal variances assumed | .290 | 498 | .772 |
| | Equal variances not assumed | .292 | 318.250 | .770 |
| Innovation | Equal variances assumed | -1.608 | 498 | .108 |
| | Equal variances not assumed | -1.620 | 317.262 | .106 |

Source: Primary Data

The p-value of the factors of the employability model was higher than .05. This revealed that there was no statistically significant differences between factors of the employability model in district wise study. This variable does not vary according to the districts selected. This may be due to the fact that the engineering students in Kerala are selected through the 'All Kerala Entrance Test'. So the districts they study may not be significant. Among the eight factors, only Intuition and Time Allocation factor got the value below .05. This means that only this factor had statistically significant difference in Intuition and Time Allocation by district wise statistics.

## 6.7.5 Marital Status Wise Group Statistics

In this section,the group statistics of the marital status is explained. Table 6.30 explains it. Table 6.30 narrates that there are two groups which were considered for the group statistics. The first one is married and the second one is unmarried. The mean of the statistics for men are statistically significant than the mean for women.

## Table 6.30

## Group Statistics

| | Marital Status | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| CDL | Married | 202 | 23.7277 | 6.14988 | .43270 |
| | Unmarried | 298 | 23.2383 | 5.82635 | .33751 |
| SKE | Married | 202 | 22.4851 | 3.92495 | .27616 |
| | Unmarried | 298 | 22.2517 | 4.02606 | .23322 |
| CEG | Married | 202 | 24.2277 | 2.90096 | .20411 |
| | Unmarried | 298 | 23.9832 | 3.01674 | .17476 |
| ITA | Married | 202 | 17.4728 | 2.62129 | .18443 |
| | Unmarried | 298 | 17.0302 | 2.92828 | .16963 |
| EI | Married | 202 | 18.7277 | 2.18546 | .15377 |
| | Unmarried | 298 | 18.4027 | 2.32370 | .13461 |
| SC | Married | 202 | 18.4802 | 1.98053 | .13935 |
| | Unmarried | 298 | 18.1208 | 2.04301 | .11835 |
| CB | Married | 202 | 17.7624 | 2.57291 | .18103 |
| | Unmarried | 298 | 17.5973 | 2.82347 | .16356 |
| Innovation | Married | 202 | 18.6980 | 1.79077 | .12600 |
| | Unmarried | 298 | 18.4463 | 2.01479 | .11671 |

Source: Primary Data

Table 6.30 explains the differences in the marital status wise score value. Table 6.31 specifies that Career Development Learning's score was slightly higher among married students. The mean value of Career Development Learning showed that unmarried graduates (23.23%) had more score value than married persons (23.72%). The next variable was Subject Knowledge and Experience and its score was more among married respondents (22.48%). The score value of eight factors in career employability model was more for married persons in the study.

**Table 6.31**
**Independent Samples Test**

| | | t-test for Equality of Means | | |
|---|---|---|---|---|
| | | t | Df | Sig. (2-tailed) |
| CDL | Equal variances assumed | .901 | 498 | .368 |
| | Equal variances not assumed | .892 | 415.816 | .373 |
| SKE | Equal variances assumed | .643 | 498 | .521 |
| | Equal variances not assumed | .646 | 438.874 | .519 |
| CEG | Equal variances assumed | .903 | 498 | .367 |
| | Equal variances not assumed | .910 | 442.698 | .363 |
| ITA | Equal variances assumed | 1.729 | 498 | .084 |
| | Equal variances not assumed | 1.766 | 461.430 | .078 |
| EI | Equal variances assumed | 1.572 | 498 | .117 |
| | Equal variances not assumed | 1.590 | 448.750 | .112 |
| SC | Equal variances assumed | 1.954 | 498 | .051 |
| | Equal variances not assumed | 1.966 | 440.452 | .050 |
| CB | Equal variances assumed | .665 | 498 | .507 |
| | Equal variances not assumed | .677 | 457.000 | .499 |
| Innovation | Equal variances assumed | 1.433 | 498 | .153 |
| | Equal variances not assumed | 1.466 | 463.150 | .143 |

Source: Primary Data (tested)

The p-value of the Career Development Learning was .368, larger than .05 but the factor Subject Knowledge and Experience had .521, it is slightly larger than .05. And another factor Capability of Engineering Graduates' p-value was .367 which is higher than .05. The Intuition and time allocation factor's p-value was .084, it is higher than .05. For Emotional intelligence p-value was .117 it is higher than .05, self-confidence's p-value was .051 it is slightly higher than .05, ComprehensiveBehaviour's p-value was .507 and it was larger than .05, and the last factor Innovation's p-value was .153 and it is larger than .05. These findings reveal that there is no statistically significant difference between factors of the employability model. This states that the factors determining employability, do not vary according to the marital status.

### 6.7.6 Result of ANOVA for Type of College and Model Factors of Employability

The study recorded significant variations for each of the factors of the model. Differences in the mean values such as Career Development Learning(CDL),Subject

Knowledge and Experience (SKE), Capability of Engineering Graduates (CEG), Intuition and Time Allocation (ITA), Emotional Intelligence (EI), Self-Confidence(SC),Comprehensive Behaviour(CB) and Innovation were statistically examined using one way ANOVA Test. This test examines the difference between more than two independent variables.

**Table 6.32**
**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error |
|---|---|---|---|---|---|
| CDL | Govt | 111 | 24.2973 | 5.56384 | .52810 |
| | Private | 329 | 23.2401 | 6.07475 | .33491 |
| | Aided | 60 | 22.9167 | 5.95546 | .76885 |
| | Total | 500 | 23.4360 | 5.95793 | .26645 |
| SKE | Govt | 111 | 22.4234 | 3.95555 | .37544 |
| | Private | 329 | 22.4043 | 3.88526 | .21420 |
| | Aided | 60 | 21.8833 | 4.56624 | .58950 |
| | Total | 500 | 22.3460 | 3.98322 | .17813 |
| CEG | Govt | 111 | 24.2973 | 2.52477 | .23964 |
| | Private | 329 | 24.0091 | 3.08565 | .17012 |
| | Aided | 60 | 24.0833 | 3.10981 | .40147 |
| | Total | 500 | 24.0820 | 2.97000 | .13282 |
| ITA | Govt | 111 | 17.1937 | 2.46168 | .23365 |
| | Private | 329 | 17.3040 | 2.83225 | .15615 |
| | Aided | 60 | 16.7167 | 3.28371 | .42393 |
| | Total | 500 | 17.2090 | 2.81401 | .12585 |
| EI | Govt | 111 | 18.8559 | 1.89183 | .17956 |
| | Private | 329 | 18.5319 | 2.30450 | .12705 |
| | Aided | 60 | 17.9500 | 2.63242 | .33984 |
| | Total | 500 | 18.5340 | 2.27226 | .10162 |
| SC | Govt | 111 | 18.1982 | 2.03523 | .19318 |
| | Private | 329 | 18.2492 | 1.99967 | .11025 |
| | Aided | 60 | 18.4833 | 2.15101 | .27769 |
| | Total | 500 | 18.2660 | 2.02372 | .09050 |
| CB | Govt | 111 | 18.1892 | 2.64408 | .25096 |
| | Private | 329 | 17.6140 | 2.66983 | .14719 |
| | Aided | 60 | 16.9667 | 3.00827 | .38837 |
| | Total | 500 | 17.6640 | 2.72359 | .12180 |
| Innovation | Govt | 111 | 18.8018 | 1.65595 | .15718 |
| | Private | 329 | 18.4863 | 2.03190 | .11202 |
| | Aided | 60 | 18.4167 | 1.80669 | .23324 |
| | Total | 500 | 18.5480 | 1.92954 | .08629 |

Source: Primary Data (tested)

Table 6.32 explained whether there existed any differences in the score value of the type of colleges for graduation and the eight factors analysed in the study. Here, the types of colleges were divided in to three categories, i.e, government, private and aided. The

first factor Career Development Learning disclosed that the mean value (24.29) of government students were higher than other type (private and aided) of students. The mean score of Subject Knowledge and Experience of the private college students was 22.40 and this was slightly higher than government college students (22.42). The next factor Capability of Engineering Graduates showed that the mean value was higher among government college students (24.29). The next factor was Intuition and Time Allocation. The mean score of this factor was higher among government college students(17.19). Another factor was Emotional Intelligence. The mean score of Emotional Intelligence was higher among government college students. The mean value of Self-Confidence showed that highest value (18.24) was recorded among private engineering students than other students. The next factor was Comprehensive Behaviour. The mean value of Comprehensive Behaviour (CB) was higher among government college students (18.18). The last factor was Innovation. The mean value of this factor was higher among government college (18.80) students than private and aided college students. The descriptive table gaveinformation on number of cases, Mean, Standard Deviation and Confidence Interval. The model analyzed through One Way ANOVA test found out that factors score value was higher among government college students.

**Table 6.33**
**ANOVA**

| | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| CDL | Between Groups | 111.149 | 2 | 55.575 | 1.569 | .209 |
| | Within Groups | 17601.803 | 497 | 35.416 | | |
| | Total | 17712.952 | 499 | | | |
| SKE | Between Groups | 14.626 | 2 | 7.313 | .460 | .632 |
| | Within Groups | 7902.516 | 497 | 15.900 | | |
| | Total | 7917.142 | 499 | | | |
| CEG | Between Groups | 6.893 | 2 | 3.446 | .390 | .677 |
| | Within Groups | 4394.745 | 497 | 8.843 | | |
| | Total | 4401.638 | 499 | | | |
| ITA | Between Groups | 17.536 | 2 | 8.768 | 1.108 | .331 |
| | Within Groups | 3933.874 | 497 | 7.915 | | |
| | Total | 3951.409 | 499 | | | |
| EI | Between Groups | 31.963 | 2 | 15.982 | 3.122 | .045 |
| | Within Groups | 2544.459 | 497 | 5.120 | | |
| | Total | 2576.422 | 499 | | | |
| SC | Between Groups | 3.437 | 2 | 1.718 | .419 | .658 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Within Groups | 2040.185 | 497 | 4.105 | | |
| | Total | 2043.622 | 499 | | | |
| CB | Between Groups | 60.616 | 2 | 30.308 | 4.137 | .017 |
| | Within Groups | 3640.936 | 497 | 7.326 | | |
| | Total | 3701.552 | 499 | | | |
| Innovation | Between Groups | 9.437 | 2 | 4.718 | 1.269 | .282 |
| | Within Groups | 1848.411 | 497 | 3.719 | | |
| | Total | 1857.848 | 499 | | | |

Source: Primary Data (tested)

The results of the one way ANOVA revealed that there were statistically no significant differences between the mean values of the different factors of the employability model. F-value was used as a test of significance of differences in mean across the groups. Mean square is the sum of squares divided by the degrees of freedom. In the first factor Career Development Learning, F-ratio was 1.569 and its p-value was .209. It indicated that the means of three groups of type of college is non-significant. The next factor was Subject Knowledge and Experience. Its p-value was .632, it was higher than .05. Only two factors, that is Comprehend Behavior and Emotional Intelligence's p-values were .017 and .045 respectively. It is less than .05. So, the three groups of types of colleges are significant among these two factors.

### 6.7.7 Result of the ANOVA for Branch Wise Analysis

The next analysis was done through branch wise with factors of employability. There were five branches selected for the study. They are Electronics and Communication Engineering, Civil Engineering, Mechanical Engineering, Electrical and Electronics Engineering and Computer Science Engineering. The descriptive statistics of branches with employability factors are given in table 6.34.

**Table 6.34**
**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error |
|---|---|---|---|---|---|
| CDL | ECE | 100 | 24.2100 | 6.78128 | .67813 |
| | CE | 100 | 23.7500 | 5.29031 | .52903 |
| | ME | 100 | 23.8800 | 5.97009 | .59701 |
| | EEE | 100 | 23.3300 | 5.91019 | .59102 |
| | CSE | 100 | 22.0100 | 5.60392 | .56039 |
| | Total | 500 | 23.4360 | 5.95793 | .26645 |
| SKE | ECE | 100 | 23.2800 | 3.56776 | .35678 |

| | | | | | |
|---|---|---|---|---|---|
| | CE | 100 | 21.4200 | 4.43170 | .44317 |
| | ME | 100 | 21.9900 | 4.08618 | .40862 |
| | EEE | 100 | 23.3000 | 3.39786 | .33979 |
| | CSE | 100 | 21.7400 | 4.02422 | .40242 |
| | Total | 500 | 22.3460 | 3.98322 | .17813 |
| CEG | ECE | 100 | 24.6800 | 2.75197 | .27520 |
| | CE | 100 | 23.2900 | 3.41208 | .34121 |
| | ME | 100 | 23.7400 | 2.95631 | .29563 |
| | EEE | 100 | 24.5200 | 2.42662 | .24266 |
| | CSE | 100 | 24.1800 | 3.04969 | .30497 |
| | Total | 500 | 24.0820 | 2.97000 | .13282 |
| ITA | ECE | 100 | 17.3000 | 2.81231 | .28123 |
| | CE | 100 | 16.8700 | 3.07615 | .30762 |
| | ME | 100 | 17.5350 | 2.60269 | .26027 |
| | EEE | 100 | 17.0800 | 2.58758 | .25876 |
| | CSE | 100 | 17.2600 | 2.96995 | .29700 |
| | Total | 500 | 17.2090 | 2.81401 | .12585 |
| EI | ECE | 100 | 19.0100 | 2.06703 | .20670 |
| | CE | 100 | 18.1000 | 2.37623 | .23762 |
| | ME | 100 | 18.5400 | 2.23571 | .22357 |
| | EEE | 100 | 18.8200 | 2.04683 | .20468 |
| | CSE | 100 | 18.2000 | 2.51058 | .25106 |
| | Total | 500 | 18.5340 | 2.27226 | .10162 |
| SC | ECE | 100 | 18.6800 | 1.96371 | .19637 |
| | CE | 100 | 18.3100 | 1.85153 | .18515 |
| | ME | 100 | 17.9900 | 1.97712 | .19771 |
| | EEE | 100 | 18.3800 | 2.01900 | .20190 |
| | CSE | 100 | 17.9700 | 2.24038 | .22404 |
| | Total | 500 | 18.2660 | 2.02372 | .09050 |
| CB | ECE | 100 | 18.3500 | 2.60293 | .26029 |
| | CE | 100 | 17.1700 | 3.00523 | .30052 |
| | ME | 100 | 17.5700 | 2.79702 | .27970 |
| | EEE | 100 | 17.8800 | 2.53174 | .25317 |
| | CSE | 100 | 17.3500 | 2.54406 | .25441 |
| | Total | 500 | 17.6640 | 2.72359 | .12180 |
| Innovation | ECE | 100 | 18.9100 | 1.80401 | .18040 |
| | CE | 100 | 18.4100 | 1.92325 | .19232 |
| | ME | 100 | 18.4900 | 1.94622 | .19462 |
| | EEE | 100 | 18.5700 | 1.89766 | .18977 |
| | CSE | 100 | 18.3600 | 2.05736 | .20574 |
| | Total | 500 | 18.5480 | 1.92954 | .08629 |

Source: Survey Data (tested)

Table 6.34 explained whether there was any difference in the score value of the branch wise graduation. The model analyzed through ANOVA test and found out that mean value (24.21) was higher in Electronics and Communication in Career Development Learning factor. The next factor was Subject Knowledge and Experience. In this, Electrical and Electronics Engineering had highest mean value (23.30). For the factor Capability of Engineering Graduates had highest mean value (18.35) in Electronics and Communication branch. In the Innovation factor, highest mean value (18.91) was given in Electronics and Communication branch. In the variable Self-Confidence the highest mean value (18.68) given in Electronics and Communication branch.This shows that the highest mean value of most of the factors is recorded in Electronics and Communication branch.

**Table 6.35**
**ANOVA**

| | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| CDL | Between Groups | 293.952 | 4 | 73.488 | 2.088 | .081 |
| | Within Groups | 17419.000 | 495 | 35.190 | | |
| | Total | 17712.952 | 499 | | | |
| SKE | Between Groups | 313.392 | 4 | 78.348 | 5.100 | .000 |
| | Within Groups | 7603.750 | 495 | 15.361 | | |
| | Total | 7917.142 | 499 | | | |
| CEG | Between Groups | 130.328 | 4 | 32.582 | 3.776 | .005 |
| | Within Groups | 4271.310 | 495 | 8.629 | | |
| | Total | 4401.638 | 499 | | | |
| ITA | Between Groups | 24.872 | 4 | 6.218 | .784 | .536 |
| | Within Groups | 3926.538 | 495 | 7.932 | | |
| | Total | 3951.409 | 499 | | | |
| EI | Between Groups | 60.832 | 4 | 15.208 | 2.993 | .018 |
| | Within Groups | 2515.590 | 495 | 5.082 | | |
| | Total | 2576.422 | 499 | | | |
| SC | Between Groups | 35.012 | 4 | 8.753 | 2.157 | .073 |
| | Within Groups | 2008.610 | 495 | 4.058 | | |
| | Total | 2043.622 | 499 | | | |
| CB | Between Groups | 86.872 | 4 | 21.718 | 2.974 | .019 |
| | Within Groups | 3614.680 | 495 | 7.302 | | |
| | Total | 3701.552 | 499 | | | |
| Innovation | Between Groups | 18.928 | 4 | 4.732 | 1.274 | .279 |
| | Within Groups | 1838.920 | 495 | 3.715 | | |
| | Total | 1857.848 | 499 | | | |

Source: Primary Data (tested)

Table 6.35 expositions that F-ratio of Career Development Learning was equal to .081,F-ratio of subject knowledge and experience was .000 which is lower than .05. This reveals that the factor Subject Knowledge and Experience is statistically significant . Another factor, Capability of Engineering Graduate's F-ratio was .005 and Emotional Intelligence F-ratio was .018 which is also less than .05. The other factor is Comprehend Behaviour. Its F-ratio is .019. It is less than .05. This means that difference between means of five groups of branches is significant in the factors Subject Knowledge and Experience, Emotional Intelligence, Comprehend Behaviour and Capability of Engineering Graduates.

## 6.8 Summary

The chapter focused on the analysis of the factors determining the employability of engineering graduates in Kerala. The study found out that there were eight factors determining the employability. They were Career Development Learning, Subject Knowledge and Experience, Capability of Engineering Graduates, Intuition and Time Allocation, Emotional Intelligence, Self-Confidence, Comprehensive Behaviour and Innovation. The result of the Factor Analysis revealed that the Career Development Learning as the highest loading factor which had factor loading as 0.920, 0.888, 0.816, 0.754 and 0.568. The variance of Career Development Learning was 36.853. Thus as per the study, the most important factor affecting the employability of engineering graduates was Career Development Learning.

The result of the independent sample t –test concluded that there was no statistically significant difference between factors of the employability model by gender. The tools used for the analysis were Independent Sample t-Test and ANOVA. The results displayed that, in Independent Sample t-Test there was no statistically significant differences between factors of the employability model. This variable did not vary according to marital status. In district wise analysis, only Intuition and Time Allocation factors were statistically significant at the same time the other factors were not statistically significant. The difference between means of five groups of branches was significant in Subject Knowledge and Experience, Emotional Intelligence, Comprehend Behaviour and Capability of Engineering Graduates. In branch wise analysis, other factors like Self –Confidence, Career Development Learning, Intuition and Time Allocation and Innovation were having statistically significant differences between variables. The present

study accomplished that there were eight factors determining the employability of engineering graduates in Kerala.

## 7.1 Introduction

India is one of the emerging economies of the world.In the modern high-tech world, development of engineering education has a vibrant and decisive role. Engineering education hascontributed to the Gross Domestic Product of every nation and it leads to human well-being. Kerala has highest literacy rate among other states of India. Kerala's engineering education was flourishing at a fast rate with more engineering institutions of different branches such us Electronics and Communication, Civil Engineering, Mechanical Engineering, Electrical and Electronics, Computer Engineering , Naval and Ship building, Bio-Medical Engineering and Food Technology. Employment opportunities in the state have not improved equivalent with the increased supply of educated manpower. Demand for engineering education is growing in Kerala. This is substantiated by the increase in the intake of students. An emerging preference was added to computer related courses over traditional disciplines in Kerala. Considering Growing number of engineering instituions, and the intake of engineering students , it is imperative to analyse the prospects and problems of the details of employment and factors affecting employability. Hence, the present study is envisioned to focus on the employment and employability of engineering graduates in Kerala.

Technical education in Kerala has undergone amazing changes in modern years.The chances of getting employed of the engineering graduates do not propagate in the same pace which match the engineering graduates who pass out in each year. This study obviously specified the supply of engineering graduates in Kerala from the year 2000 to 2016. Employability is an evergreen concern of every economy. The present investigation is an attempt to study the types and nature of employment and the factors affecting the level of employability of engineering graduates in Kerala. Unfortunately, these critical problems of the engineering graduates are not well analyzed. A systematic study of these issues is inevitable for any proper policy formulation to make the engineering graduates employable in Kerala. It is in this backdrop, the employment and employability of engineering graduates in Kerala is studied.

## 7.2 Structure of the Study

The main issue of the labour market in Kerala is the existence of educated unemployment.Various studies revised from national and international level had found out that the employability was a common factor and this is related to individual's job security.

After the year 2000, the number of engineering colleges has increased and more students were interested to join engineering graduation. At the same time there is an imbalance between supply and demand of engineering graduates over the years. In Kerala, the engineering education has considerably preferred by students and their parents as a good profession to pursue. Nevertheless, most of the people fail to find good job after engineering graduation.At this juncture, the concept of employability becomes quite appalling. Thereby the details of employment and factors affecting employability become an investigative area to be researched out.

In the light of the problem stated, the present study becomes relevant. The broad objective of the study is to analyze the details of employment such as nature, types and conditions, and the factors affecting employability of engineering graduates across various branches in Kerala.

The secondary data on the trend and pattern of supply of engineering graduates in Kerala from the year 2000 to 2016 was collected from Annual Technical Manpower Review, unpublished data from the Universities in Kerala, Economic Review Publication of Government of Kerala, National Technical Manpower Information System (NTMIS) Nodal Center of Kerala, and Directorate of Technical Education. The primary data essential for the study was; nature, types and condition of employment that the engineering graduates received and the factors affecting the employability of engineering graduates in Kerala.In thedata of the selected engineering graduates, a multistage sampling was resorted to. The districts selected for the study were Ernakulam and Thiruvananthapuram. From Ernakulam, one aided college, and five unaided colleges were selected for the study. The list of engineering graduates in the two selected areas of the study constituted the sampling frame. The sample design was done on the basis of multistage sampling. From the district of Thiruvananthapuram, two government colleges and four unaided colleges were selected. The sample of the study was 500 employed engineering graduates, constituting 250 from Ernakulam and 250 from Thiruvananthapuram. From various engineering branches five were selected because majority of the enrolled candidates preferred these branches. They are Electronics& Communication, Mechanical Engineering, Civil Engineering, Computer Science and Electrical and Electronics Engineering.

The theoretical frame work of the study constitutes the employability model which is Career EDGE model. To evaluate of the factors affecting the employability of engineering graduates, Career Edge Model was used. It is a new theoretical outline of employability. This employability model was developed by Decre Pool and Peter Sewell in 2007. The model described the important components of employability and endorse the direction of interaction between the elements. There are two layers in this model. The lower layer consists of five basic elements that learners can work on to approach their employability (Career Development and Learning, Experience, Degree Subject Knowledge, Generic Skills and Emotional Intelligence). The medium layer, which is reflection and evaluation, reform a high level of processing on what students have already developed so that ultimately and hopefully their self-esteem, self-efficacy and self-confidence, strictly associating to employability, can be improved. In this model, 28 statements were used to find out the employability level of engineering graduates in Kerala. After the factor analysis, we got eight important factors affecting employability. They are Career Development and Learning (CDL), Subject Knowledge and Experience (SKE), Capability of Engineering Graduates (CEG), Intuition and Time Allocation (ITA), Emotional Intelligence(EI), Self –Confidence (SC), Comprehensive Behaviour (CB), and Innovation.

## 7.3 Major Findings

The major findings of the study can be summarized as follows.

### 7.3.1 Supply of the Engineering Graduates in Kerala

- The first objective was to find out the trend and pattern of engineering graduates in Kerala from the year 2000 to 2016. The study has found out that outturn rates of engineering graduates have increased but at a declining rate. The intake rates have increased.
- We found that mainly five branches' intakes were increasing i.e. Electronics and Communication, Civil Engineering, Mechanical, Electrical and Electronics Engineering and Computer Science Engineering.
- The activity analysis of the engineers in Kerala showed that majority (64.02%) of the engineers at graduate levels were employed as regular paid employees at the graduation level itself.

- ❖ The activity status of the engineering graduates revealed that there was a trend of declining rate of employment and the rate of unemployment was increasing from 2008 onwards though there was a slight decrease the years 2012, 2013, 2014 .The overall status clearly pointed out that the rate of unemployment was increasing as we analyzed the data from the year 2000-2016.
- ❖ The average unemployment rate was 21.59 per cent.
- ❖ In the year 2000 the actual intake was 8820 and outturn was 4894 and both intake and outturn were growing. In the year 2005, the actual intake was 25124 and outturn was 9026. At the latest year of the study i.e, 2016 the intake was 60376 and outturn was 24998.It demonstrated that the actual intakes and outturn increasing year by year. Though there was increase in the number of intake of students, the outturn was not increasing proportionately.
- ❖ In gender wise classification of actual intakes, boys were more than girls in engineering education.

### 7.3.2 Employment of Engineering Graduates in Kerala

#### 7.3.2.1 Details of Employment

- ➢ The male graduates were employed more than female graduates.
- ➢ The study found out that majority of the engineering graduates (64%) were Hindus followed by Christians (26.8%) and Muslims (9.2%).
- ➢ The 69 per cent of the respondents belonged to 25-30 age category. The selected engineering degree holders had an average age of 27 years.
- ➢ Majority of the respondents were unmarried persons, 65.6 per cent. The study found that among sample districts, unmarried respondents were higher in Ernakulam district (57.93%) than Thiruvananthapuram (42.07%).
- ➢ It is found out that majority of the graduates (97.8%) were selecting the course of engineering after PlusTwo course.
- ➢ 52.6 per cent of the respondents were working in IT field.
- ➢ Coming to the nature and types of employment, most of the respondents (79%) had temporary job and 21 per cent had permanent job. In the branch wise classification, Computer Science Engineering branch had more temporary workers (32.4%). 52.8 per cent of the respondents were working in Core Firm than Software Firm (47.2%).

- Majority of the respondents (71%) had monthly income between the range of 10000 to 30000.Looking into the total years of service it was seen that 83.4 per cent of the respondents had a total years of service was between 1-3 years.
- Majority of the respondents (76.6%) did not have changes in job and working places and majority of the engineering graduates (87.2%) were working within Kerala. It was also observed that 62 per cent of the engineering graduates were working for low earning.
- The present study found that low salary is the main problem of engineering graduates in Kerala. More working hours, less chance of promotion, poor working environment, and family consideration were the main problems of engineering graduates. It was observed that majority of the respondents (60.8%) did not respond to the queries on the level of satisfaction. It indicated that respondents were under pressure to be open and genuine. 62 per cent of the respondents explained that trade union had no role in their institutions. 59.8 per cent of the respondents were open enough to tell that the working hours were more than eight hours.
- 64.6 per cent explained that their job was not providing any promotion facilities.
- The study applied the tool of Independent Sample t-Test to find out the relationship between income and gender. It was found that there was statistically significant relationship between gender and income of the engineering graduates.
- The study devoted the tool of Correlation to find out the relationship between age and marks. The study found out that there was a negative correlation between age and marks of engineering graduates.
- Correlation was used to find out the relation between income and total years of service.

  There was a positive relationship between income and total years of service. If a total year of service rises, the increment increases and it automatically leads to increase in salary and this income.

### 7.3.3 Factors affecting the Employability of Engineering Graduates in Kerala

#### 7.3.3.1 Employability Details

Employability plays a significant role in professional success of a person. Skills are important for employability. Various skills such as communication skill ,which is more required for getting employable and subject knowledge, self-confidence, engineering skill, time management skills, listening skills, planning and organizing, and practical knowledge were the important skills required for the employability of a person in the engineering stream. The present study used the career EDGE model as frame work. There were 28 statements used to find out the employability of engineering graduates. The study brought that the male respondents and female respondents had employability. But, employability of female graduates was lower than male graduates. Factor Analysis was used to find out the factors affecting employability. There were eight factors affecting and having a substantial influence on employed engineering graduates' employability in Kerala. They are Career Development and Learning (CDL), Subject Knowledge and Experience (SKE), Capability of Engineering Graduates (CEG), Intuition and Time Allocation (ITA), Emotional Intelligence (EI), Self –Confidence (SC), Comprehensive Behaviour (CB),and Innovation. Career Development and Learning factor is the most important factor which affected the employability of engineering graduates. The Factor Loadings of Career Development Learning was 0.920, 0.888, 0.816, 0.754 and 0.568 respectively for each statement. The second factor was Subject Knowledge and Experience (SKE).The factor loadings of this factor were 0.830, 0.786, 0.687, and 0.638.The variance of subject knowledge and experience was 20.183. The third factor was Capability of Engineering Graduates (CEG). The factor loadings of these factor statements were 0.832,0.802,0.743, and 0.668.The variance of this factor was 14.356.The fourth factor was Intuition and Time Allocation (ITA). The factor loadings of statements were 0.877, 0.864and 0.734.The variance of this factor was 9.056. The fifth factor was Emotional Intelligence (EI). The factor loadings of statements were 0.887, 0.852 and 0.763.The variance of this factor was 8.714.The sixth factor was Self –Confidence (SC). The factor loadings of the statements were 0.825, 0.772 and 0.703. The variance of this factor was 7.654. The seventh factor wasComprehensive Behaviour (CB). The factor loadings of statements were 0.806, 0.754 and 0.642.The variance of this factor was 8.928. The eighth factor was Innovation. The factor loadings of statements were 0.827, 0.692 and 0.571. The

variance of this factor was 8.40. Independent Sample t-Test was used to find out the relationship between eight factors used for Factor Analysis and gender and found out that there was no significant relationship. This may be due to the fact that gender has no role in employability. It is the skill that matters.The results of ANOVA had no significant differences between the mean values of the different factors of the employability and type of college. Only two factors (Comprehend behavior and emotional intelligence) had p-values between .017 and .045.It is less than .05. So, the three groups of type of college is significant in these two factors.The difference between means of five groups of branches is significant in Subject Knowledge and Experience,Emotional Intelligence,Comprehend Behaviour and Capability of Engineering Graduates. In branch wise analysis, other factors like Self –Confidence, Career Development Learning, Intuition and Time Allocation,and Innovation did not have any statistical difference between the variables used in ANOVA.The tool 'ANOVA' was used to find out the relationship between branches and factors from factor analysis. Comprehend Behaviour, Subject Knowledge and Experience, Capability of Engineering Graduates and Emotional Intelligence had displayed a statistically significant relationship between branch wise and eight factors of employability.

## 7.4 Evaluation of the Study

The soul of the study lies in the analysis of the aspects of the employment and employability of engineering graduates in Kerala.The broad objective set up of the study was to examine the employment details and factors affecting the employability of engineering graduates in Kerala. Before analyzing this, we used secondary data to find out the trend and pattern of supply of engineering graduates in Kerala. The National Technical Manpower Information System(NTMIS), Nodal Centre, Government of India, Unpublished data on various universities in Kerala, Economic Review of Government of Kerala, and Directorate of Technical Education were the sources of data. According to secondary data of government of Kerala, and India there were 106593 passed out students in all branches from the year 2010to 2016.We have selected the passed out engineering graduates from five branches namely, Electronics and Communication, Civil, Mechanical, Electrical and Electronics and Computer Science Engineering. So, a district wise analysis andcollege wise passed out students from the year 2010-2016 from various branches were undertaken. The district of Ernakulam had the highest number of engineering colleges in Kerala and the district of Thiruvananthapuram is the second one to have the engineering

colleges. So, these two districts were selected for the study.Factors behind the employability of the engineering graduates were identified in the study.

A brief profile of the districts and engineering graduates' were also touched upon. The engineering graduates belonged to the three major religions of Kerala, with Hindusconstituting the majority, followed by Christians and Muslims. Majority of the engineering graduates belonged to age group between 25 -30 years. The main type of college for graduation was private self-financing colleges. The graduation and employment details of employed person, and a comparison of the two districts of the study namely Ernakulam and Thiruvananthapuram were done in the study.

The trend and pattern of supply of engineering graduates were estimated. Actual intakes or enrollment of students for engineering graduation were increasing year by year. But the outturn rates of engineering students were increasing at a disproportionate rate.

In the analysis of nature, types and conditions of employment the study found out that temporary workers were more than permanent workers. Employed engineering graduates were high in software firm than in core firms. As we consider the employment of engineering graduates, it was found out that majority of the engineering degree holders were working within Kerala and they were not working according to their qualification-related job or selectedbranch related job. They were also under paid. The study brought out that employed engineering graduates' face different problems in their career such as low wages, less promotion, poor working situation, and less time for the consideration of the family.This has to be viewed seriously by the concerned authorities.

In the estimation of factors affecting or determining the employability, Career EDGE model wasused and the model identified 28 statements and it lead to find out the employability. The study found that eight factors(Career Development Learning,Subject Knowledge and Experience, Capability of Engineering Graduates, Intuition and Time Allocation, Emotional Intelligence, Self –Confidence, Comprehensive Behaviour,and Innovation)were affecting employability of engineering graduates in Kerala. The increased intakes of engineering graduates and low growing rate of outturn rate, unemployment and underemployment of engineering graduates and low industrial performance in Kerala should draw the attention of the policy makers to improve the situation of employment and employability of engineering graduates in Kerala.

## 7.5 Contribution of the Researcher

The contribution of the study centres on the employment particulars and factors affecting employability of the engineering graduates in Kerala. Using the Career EDGE Model of Decre Pool and Peter Sewell and the tool of Factor Analysis, found out that Career Development and Learning (CDL) was the important factor affecting the employability of engineering graduates in Kerala. The study further contributed that engineering employees in Kerala are low paid and made to work more than eight hours especially in IT sector. The nature of the employment of the engineering graduates were temporary than permanent. The engineering employees in Kerala face the problems of less chance of promotion, poor working environment, less time for family, poor payment and under employment. The engineering education in Kerala suffers the problem of disproportionate outturn compared to the intake. These contributions can be an eye opener to the government of Kerala and the Directorate of Technical Education to formulate proper policies for the employment and employability of engineering graduates in Kerala and to create more skilled labour force for the state of Kerala.

## 7.6 Areas for future research

i). Measurement of Employability of engineering or other educated graduates can be attempted with modified methodologies comparing developed and developing nations of the world.

ii). Studies can be attempted on the sustainability of technical graduates and skilled labour force using the same methodology comparing sample from two or more states in India..

iii). More rigorous studies can be made associating employability and employment. The present study prepared only a blameless attempt on this.

iv). Comparisons can be made on employment and employability drawing samples from different states of our country.

v). Studies are possible on associating unemployment, underemployment and employment of engineering graduates comparing India and China.

vi)The present study is limited to employment and employability of engineering graduates, it can be further studied for other undergraduate courses as well.

## 7.7 Suggestions

To create employment and employability of the engineering graduates inKerala , the study gives the following suggestions.

- The study has brought out that the employed engineering graduates in Kerala have employability level and eight factors were determining employability. So, it is suggested that giving new employment opportunities by starting new industries for engineering graduates by the government of Kerala.

- The study suggests that focus should be given to skill development programmes and practical classes should be provided at the time of graduation. The faculties should be trained under 'train the trainer' programmes thereby focusing on teaching methods and pedagogy mandatory for the faculties of engineering colleges' and professors in universities.

- The syllabus should be organized in such a way that the exposure to industry experience will directly benefit the engineers and increase the level of employability.

- The study revealed that engineering graduates' intakes were increasing year by year. Hence, more Startup companies should be introduced and its expansion has to be taken up by the government agencies.

- There should be student friendly examinations and assessment pattern at engineering graduation level.

## 7.8 Policy Implications

- The study found out that there is a declining trend in outturn rates of engineering graduates in Kerala. The governments of Kerala should take initiative to bring standard syllabus, provideexperienced faculties and take mandatory actions to determine evaluation process of engineering exam.

- The government of Kerala should bring out policies to face out the unemployed engineering graduates and underemployed engineering graduates for gainful industrial openings.
- The study estimated that the level of employability is higher for men than for women. The directorate of Technical Education and the government of Kerala should develop policies to give more skilled training to women.

## 7.9 Conclusion

The present study has focused on the employment and employability of the engineering graduates in Kerala.The study has revealed that the aspects of employability depends on the eight factors such as Career Development Learning (CDL) , Subject Knowledge and Experience (SKE), Capability of Engineering Graduates (CEG), Intuition and Time Allocation (ITA), Emotional Intelligence (EI), Self –Confidence (SC), Comprehensive Behaviour (CB) , and Innovation. These variables play an important role in strengthening the self confidence level of the engineering student to get a good job. The present study found out that each employed engineering graduates have employability but its level was different. Therefore, higher education department should put in effort to formulate employable persons in professional courses especially engineering graduation courses.

Initiative should be taken by the universities and colleges for developing, skill, knowledge and ability of their students. The quality of institutional factors such as teaching, training, infrastructure and culture should be boosted by the state and central government to generate professional development of the students. India's biggest asset is human resources, in terms of quality and quantity. So, efforts should be made to enable the engineering students to get more employment opportunities and each engineering graduates should be employable through their graduation at least by the end of the year 2025.

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# Appendix I

# Employment and Employability of Engineering Graduates in Kerala.

## Interview Schedule

Survey among Engineering Graduates

This survey is executed as a part of research work leading to the award of PhD Degree in Economics from Calicut University. This study generally aims in observe the employability of Engineers and look into the nature, types and condition of employment they acquire.Information collected through this survey will be used only for research purpose and not for any other purpose. Your kind co-operation is requested.

**Sruthy K S**

**(Research Scholar, P.M.Govt.College, Chalakudy)**

**PART-1 Profile of the Respondent Schedule No:**

1. Name :

2. Gender : 1=Male, 2=Female

3. Age :

4. Email :

5. Phone Number :

6. Religion : 1.Hindu 2.Muslim 3.Christaian 4. Others

7. Marital Status : 1= Married, 2=Unmarried, 3= Divorced

**PART –IIEducational Background of the Respondent**

8.What course did you choose after SSLC?
1= Plus Two, 2=Diploma, 3= Others

9. If Others, please specify

10. Have you written Entrance Examination: Yes ☐ No ☐

11. If Yes, Name of the Entrance Exam : NEET ☐ KEAM ☐ Others ☐

12. Number of times Attempted : ☐

13. If, admission through : Management ☐ NRI Quota ☐ Others ☐

## III. Engineering Graduation Details

14. Name of the college : ☐

15. Branch Name : ☐

16. Type of the College : ☐ 1=Government, 2= Private, 3=Aided, 4=Others

17. If others, Please specify: _____

18. Reasons for selecting Particular College: (Please rank your preferences)

| Sl.No | Reasons for selecting Particular College | Rank |
|---|---|---|
| 1 | Campus Facilities | |
| 2 | Allotment | |
| 3 | Reputation of the college | |
| 4 | Academic Quality | |
| 5 | Placement Opportunities | |
| 6 | Closeness to Home | |

19. Reasons for Selecting Particular Branch: ☐ 1.Self-interest 2.Allotment 3. Compulsion by Parents/others 4. Ability 5.Accidently

20. Have you cleared the exams in the first attempt: Yes ☐ No ☐

21. If No, the number of back papers : ☐

22. Total percentage of mark in engineering graduation : ☐

23. Please Specify your judgment about your college campus.(Please use the "√ " mark)

| Judgment factors | Excellent | Good | Average | Below average | Poor |
|---|---|---|---|---|---|
| College faculty members | | | | | |
| College library | | | | | |
| Computer facility | | | | | |
| Learning environment of campus | | | | | |
| Classes/Practical classes | | | | | |

24. Did you have any personality development classes in your college?

Yes ☐ No ☐

25. Is there any placement cell in your institution? Yes ☐ No ☐

26. Is it more effective in your college? Yes ☐ No ☐

27. a) what problems do you face during the period of engineering graduation? ☐

1. Low Campus facility, 2.Less Faculty members,

3. Marks, 4.Others

b) If others, specify the Problem: _____

28. a) Have you been in extra-curricular activities? Yes ☐ No ☐

b) If yes, please tick the activities: 1) NCC 2) NSS 3) Sports 4) Off stage programmes 5) Stage programmes

## IV. Employability Skill Details

Some of the skills are given below. Please tick the answer correctly:

29. How confident do you feel at the completion of your engineering graduation with respect to the following skills? (Please tick)

| Skills | Very much | Some what | Moderately | Mildly | Not at all |
|---|---|---|---|---|---|
| Communication skill | | | | | |
| Subject Knowledge | | | | | |
| Presentation Skill | | | | | |
| Self confidence | | | | | |
| Engineering Skills | | | | | |
| Time Management | | | | | |
| Listening skills | | | | | |
| Planning&organizing | | | | | |
| Problem solving | | | | | |

30. Have the above skills helped you in getting employed? Yes ☐ No ☐

31. In your opinion which is the most important skills required for engineering job?

32. a) Is there any additional skill required for getting employed? Yes ☐ No ☐

b) If yes, specify the skills _____

33. Do you think that the quality of project is important in getting employed?

Yes ☐ No ☐

34. Some of the statements are given below. This is a personal development tool that should help you to know about your skills and to identify the possible areas for development over the next year. So please try to answer honestly and accurately as possible using tick mark.

1-Strongly Disagree, 2-Disagree, 3-Slightly Disagree 4-Neither agree nor disagree, 5-Slightly Agree, 6-Agree, 7-Strongly Agree.

| | **Career** Development Learning | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | I know what kind of work would outfit my personality | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | I discern about what is required factor for me successfully sort of job I want to do | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | After my graduation I know what I want to do. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | I have familiar with where to find out information about the employment that interest me | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | Apart from money,I Know what I want from my working Life. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | **Experience Work/Life** | | | | | | | |
| 6 | I have lot of work experience | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7 | I can explain the value of my experience to a potential employer | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | **Degree Subject Knowledge** | | | | | | | |
| 8 | I am satisfied with academic performance | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9 | My academic performance so far is in line with my career aspirations | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | **Generic Skills** | | | | | | | |
| 10 | I have good oral communication skill | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11 | I am good at making presentations | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12 | I am confident to my writing communication skill | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13 | I work well in a team | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14 | I have good time management skill | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15 | I work well independently | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16 | I am good at solving problems | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 17 | I have good planning& organizational skill | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18 | I am confident to use IT | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 19 | I satisfied with my level of numeracy | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 20 | I am prepared to accept responsibility for my decisions | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21 | I am able to adjust easily to new situation | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22 | I have good understanding on how business operate | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23 | I am good at coming up with new ideas | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24 | I can pay attention to detail when necessary | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25 | I am always open to new ideas | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | **Emotional Intelligence** | | | | | | | |
| 26 | I am good at working out what other people are feeling | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 27 | I am able to manage my emotions effectively | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28 | I am good at knowing how I am feeling at a given time | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

## V.Employment Details of the Respondent

35. a) Are you Employed? Yes ☐ No ☐

b) If yes, name of the Institution and Place _____

c) Nature of the Present Job: ☐ 1= Temporary, 2= Permanent

d) Are you placed through campus selection? Yes ☐ No ☐

e) Core firm ☐ software firm ☐

f) Nature of the management of institution: ☐ 1= Govt, 2= Aided, 3=Private

36. If No, what is your present status: ☐ 1= Self-employed, 2=Not yet-Employed, 3= student, 4= others

37. Total years of service: ☐

38. How much you earn in a month? Specify _____

39. Mention the duration you spent to get a job: _____

40. a) Is your job suited for your qualification? Yes ☐ No ☐

b) If no, why do you say so? Specify _____

41. a)Have you worked in some other company? Yes ☐ No ☐

b) If yes, which company? _____

42. How many times you changed the job after first placement? _____

43. What are the problems you faced from job? (Please tick)

Low salary ☐

More working hours ☐

Poor working environment ☐

Less chance of promotion ☐

Family consideration ☐

Others ☐

44. a) Do you satisfied with the present job: Yes ☐ No ☐

b) If no, specify the reason _____

45.a) Have you ever wished to work abroad? Yes ☐ No ☐

b) If yes, why? _____

46. Following statements are given below. Please read each one and give your opinion about working situation of company details. (Use tick mark)

a) I am satisfied working with this organization/company.

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

b) Company gives the maximum salary.

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

c) Management respects our personal rights.

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

d) Trade union is more active in this organization.

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

e) Trade union has no role in this institution

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

f) Management is not very interested in the feelings of the staff.

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

g) There is a friendly feeling of management & staff.

Strongly disagree Disagree Neutral Agree Strongly Agree

☐ ☐ ☐ ☐ ☐

h) More working hours are there.

Strongly disagree Disagree Neutral Agree Strongly Agree

☐ ☐ ☐ ☐ ☐

i) Company gives more importance to their workers.

Strongly Disagree Disagree Neutral Agree Strongly Agree

☐ ☐ ☐ ☐ ☐

j) This job is not providing promotion.

Strongly Disagree Disagree Neutral Agree Strongly Agree

☐ ☐ ☐ ☐ ☐

47. Which is the most attractive factor in your job? ☐ 1= Salary, 2=Job Status, 3= Less Working hours, 4=Others

48. Do you have any suggestion on working condition?

| | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

49. What is your observation towards the most required changes of engineering education system? (Please list out one by one)

| | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

*Thank you for your co-operation*

# Appendix II
# Total Unemployed Graduate Engineers (State wise)

| Selected State-wise Number of Total Unemployed Engineers (Degree ) in India (2004 to 2016) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **States** | **Degree Level** | | | | | | | | | | | | |
| | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** |
| Andhra Pradesh | 11865 | NA | NA | 48372 | 50128 | 62774 | 75142 | NA | NA | 100256 | 125467 | 133652 | 186423 |
| Assam | 474 | 884 | 579 | NA | NA | NA | 604 | 638 | 725 | 794 | 856 | 915 | 1068 |
| Chandigarh | 239 | 35 | 188 | 196 | 254 | - | - | 421 | 463 | 586 | 612 | 663 | 679 |
| Chattisgarh | - | - | - | 1421 | - | - | - | 1744 | 1803 | 1856 | 1920 | 1984 | 2013 |
| Delhi | 440 | 371 | 436 | 1027 | 1526 | 1687 | 1911 | 2056 | 2197 | 3045 | 3874 | 4237 | 4961 |
| Gujarat | 7642 | NA | NA | NA | 10235 | 11657 | 12843 | - | - | 30145 | 32656 | 41025 | 45102 |
| Haryana | 1206 | 1029 | 2585 | 2855 | 3044 | 3564 | 4021 | 4519 | 6078 | 6104 | 6411 | 5276 | 6847 |
| Himachal Pradesh | 333 | 527 | 68 | NA | NA | NA | NA | 1022 | 1561 | 1874 | 2541 | 2946 | 3217 |
| Jammu & Kashmir | 768 | 378 | 851 | 1094 | 1468 | 1689 | 2356 | 2014 | 2481 | 3015 | 3129 | 2984 | 3561 |
| Karnataka | 12771 | 12146 | 14342 | 17123 | 19324 | 19875 | 102561 | 108147 | 124653 | 131657 | 148946 | 159873 | 167063 |
| Kerala | 2115 | 1129 | 1568 | 2799 | 3687 | 3945 | 4125 | 3012 | 5014 | 6241 | 10045 | 15036 | 13248 |
| Madhya Pradesh | 2362 | 4780 | NA | 6688 | NA | NA | NA | 8127 | 9541 | 9723 | 10348 | 11694 | 12347 |
| Maharashtra | 27639 | NA | NA | NA | 59812 | 84517 | 95612 | 99236 | 114118 | 122351 | 124557 | 132584 | 140012 |
| Orissa | 3267 | 7677 | 6530 | 5382 | 4129 | 6027 | 6843 | 7198 | 6985 | 7612 | 7745 | 7924 | 8026 |
| Punjab | 2038 | 3008 | 1922 | 2324 | 2469 | 3021 | 3455 | 2984 | 3047 | 3694 | 4051 | 4325 | 4872 |
| Rajasthan | 1453 | 2291 | 3674 | NA | NA | NA | NA | 4165 | 4387 | 4582 | 5230 | 5371 | 5804 |
| Tamil Nadu | 49752 | 51831 | NA | 60320 | 80457 | 99314 | 100457 | 124350 | 135474 | 150789 | 154321 | 160011 | 161346 |
| Uttar Pradesh | - | NA | NA | NA | 3241 | 1567 | 4002 | 4127 | NA | NA | 5017 | 5364 | 5871 |
| West Bengal | 1616 | 1854 | 2676 | 3459 | 4273 | 5128 | 5397 | 6281 | 6642 | 7018 | 6814 | 7194 | 7325 |

NA: Not Applicable
(-): Implies data not available.
Source: Institute of Applied Manpower Research (Various Reports)

# Appendix III
# Number of Engineering Degree Holders in India

| Estimated Number of Engineering Degree Holders in Working Age Group by Selected Disciplines in India (1999 to 2015) (In Number) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Discipline** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Civil | 178860 | 184860 | 190760 | 196560 | 200544 | 242143 | 273642 | 301892 | 321753 | 355684 | 376128 | 401241 | 411257 | 436517 | 462985 | 473144 | 496572 |
| Mechanical | 214430 | 224210 | 233820 | 243280 | 256518 | 264153 | 271483 | 285412 | 293641 | 301246 | 310235 | 321146 | 332654 | 341653 | 350034 | 362594 | 371540 |
| Electrical | 131970 | 138250 | 144430 | 150500 | 156000 | 168450 | 172483 | 176823 | 182340 | 190012 | 195327 | 204176 | 210046 | 219763 | 223047 | 230694 | 237561 |
| Chemical | 41760 | 43830 | 45850 | 47850 | 50951 | 51234 | 51687 | 52984 | 54238 | 58120 | 60147 | 66431 | 67254 | 69684 | 70124 | 73281 | 76487 |
| Electronics & Telecom | 132020 | 148320 | 164340 | 180090 | 190284 | 203465 | 224713 | 241571 | 264992 | 276579 | 281031 | 302145 | 336417 | 351764 | 368976 | 374120 | 378532 |
| Metallurgy | 17370 | 18050 | 18710 | 19370 | 19875 | 20310 | 21047 | 24996 | 25789 | 27143 | 27698 | 28462 | 28753 | 29604 | 30048 | 30451 | 31456 |
| Mining | 7800 | 8210 | 8610 | 9010 | 9357 | 9543 | 9627 | 9718 | 9907 | 10243 | 11564 | 13472 | 14975 | 15742 | 16047 | 18694 | 19547 |
| Automobile | 3490 | 3720 | 3950 | 4180 | 4390 | 4489 | 4492 | 4526 | 4671 | 4702 | 4816 | 4922 | 4981 | 5064 | 5394 | 5471 | 5563 |
| Aeronautical | 2150 | 2220 | 2300 | 2370 | 2459 | 2487 | 2503 | 2571 | 2648 | 2693 | 2741 | 2806 | 2857 | 2911 | 2967 | 3056 | 3149 |
| Agriculture | 4680 | 4860 | 5040 | 5220 | 5550 | 5741 | 5874 | 5963 | 6214 | 6381 | 6427 | 6539 | 6710 | 6833 | 6942 | 6987 | 7024 |
| Production | 18600 | 20500 | 22360 | 24190 | 26152 | 28631 | 31025 | 32641 | 34612 | 36487 | 38452 | 40123 | 42632 | 44891 | 46250 | 48001 | 49560 |
| Sugar | 1670 | 1700 | 1730 | 1750 | 1773 | 1802 | 1863 | 1872 | 1902 | 1965 | 1987 | 1993 | 2011 | 2014 | 2163 | 2175 | 2205 |
| Oil | 1000 | 1060 | 1120 | 1180 | 1213 | 1235 | 1284 | 1302 | 1316 | 1348 | 1394 | 1405 | 1437 | 1459 | 1481 | 1492 | 1507 |
| Textile | 11900 | 12490 | 13080 | 13650 | 14226 | 14553 | 14842 | 15002 | 15124 | 15264 | 15327 | 15569 | 15810 | 15864 | 15941 | 15968 | 15993 |
| Architecture | 18150 | 19390 | 20600 | 21800 | 23073 | 24517 | 25892 | 26841 | 27463 | 28415 | 29740 | 30152 | 31652 | 31942 | 32214 | 32567 | 32940 |
| Food | 1390 | 1480 | 1570 | 1650 | 1766 | 1846 | 1890 | 1905 | 1963 | 1984 | 2011 | 2018 | 2157 | 2241 | 2304 | 2405 | 2541 |
| Instrumentation | 15190 | 17040 | 18850 | 20640 | 22259 | 23014 | 24001 | 25016 | 26001 | 27148 | 28426 | 29001 | 30264 | 31861 | 32015 | 33697 | 33810 |
| Ceramic | 1200 | 1260 | 1320 | 1370 | 1656 | 1806 | 1895 | 1904 | 1948 | 1993 | 2065 | 2169 | 2415 | 2657 | 2703 | 2869 | 2982 |
| Leather | 930 | 970 | 1020 | 1060 | 1161 | 1196 | 1253 | 1281 | 1306 | 1359 | 1400 | 1452 | 1493 | 1508 | 1539 | 1581 | 1634 |
| Others | 122350 | 136210 | 149830 | 163230 | 193979 | 201356 | 225391 | 241503 | 246912 | 265310 | 275413 | 291057 | 301256 | 310560 | 327814 | 336954 | 350911 |
| **Total** | **913740** | **969540** | **1024380** | **1078290** | **1183186** | | | | | | | | | | | | |

Source:All India Council for Technical Education (AICTE),1999-2015

# Appendix IV
# State Wise Students Intakes in Engineering Degree in India

| State-wise Students Intake in Degree Engineering in India (1999-2000 to 2009-2010) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **State/UTs** | **1999-2000** | **2000-2001** | **2001-2002** | **2002-2003** | **2003-2004** | **2004-2005** | **2005-2006** | **2006-2007** | **2007-2008** | **2008-2009** | **2009-2010** |
| Andhra Pradesh | 25435 | 30561 | 46750 | 64300 | 68754 | 75412 | 79681 | 84254 | 88631 | 94125 | 97547 |
| Arunachal Pradesh | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 212 | 216 | 216 |
| Assam | 660 | 660 | 720 | 720 | 734 | 738 | 751 | 758 | 764 | 778 | 781 |
| Bihar | 2635 | 3160 | 1335 | 1575 | 1647 | 1482 | 2154 | 1963 | 2014 | 2231 | 2147 |
| Chandigarh | 530 | 560 | 460 | 580 | 593 | 631 | 611 | 642 | 608 | 642 | 712 |
| Chhatisgarh | 0 | 0 | 3200 | 3385 | 3417 | 3585 | 3624 | 3713 | 3974 | 4156 | 4521 |
| Delhi | 2420 | 2560 | 2950 | 3540 | 3871 | 3965 | 4102 | 4463 | 4791 | 4952 | 5063 |
| Goa | 334 | 404 | 710 | 740 | 759 | 772 | 794 | 803 | 819 | 824 | 843 |
| Gujarat | 5885 | 7370 | 9376 | 9559 | 10211 | 11354 | 12784 | 13651 | 14832 | 16342 | 18724 |
| Haryana | 6125 | 7445 | 8145 | 9385 | 9842 | 10421 | 12687 | 14539 | 15741 | 18746 | 19321 |
| Himachal Pradesh | 410 | 410 | 410 | 610 | 712 | 763 | 785 | 796 | 806 | 814 | 867 |
| Jammu & Kashmir | 1360 | 1360 | 1165 | 1245 | 1286 | 1172 | 1863 | 1941 | 2003 | 2146 | 2289 |
| Jharkhand | 0 | 0 | 1560 | 1890 | 2036 | 2473 | 2617 | 2873 | 3145 | 3364 | 3517 |
| Karnataka | 26337 | 30152 | 36625 | 40160 | 42301 | 44569 | 47314 | 50234 | 55987 | 59147 | 63214 |
| Kerala | 5385 | 6815 | 10654 | 18083 | 21034 | 25786 | 29174 | 32653 | 35410 | 41235 | 46320 |
| Madhya Pradesh | 7735 | 10380 | 9950 | 12970 | 13452 | 12657 | 13784 | 14120 | 13659 | 14327 | 14863 |
| Maharashtra | 35835 | 41315 | 43620 | 47035 | 49712 | 50361 | 53742 | 55367 | 58743 | 61234 | 65283 |
| Manipur | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 162 | 168 | 170 |
| Meghalaya | 0 | 180 | 180 | 135 | 166 | 184 | 176 | 188 | 208 | 246 | 267 |
| Mizoram | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Orissa | 6360 | 7000 | 8665 | 9505 | 10234 | 10657 | 11321 | 12054 | 12643 | 13064 | 13864 |
| Pondicherry | 580 | 940 | 1690 | 1950 | 2014 | 2436 | 2871 | 3169 | 3586 | 3924 | 4102 |
| Punjab | 4050 | 4720 | 5320 | 8875 | 9631 | 10234 | 11425 | 12748 | 13964 | 15783 | 16842 |
| Rajasthan | 2964 | 5164 | 5984 | 7807 | 8102 | 8436 | 8974 | 9123 | 9265 | 9587 | 9863 |
| Sikkim | 220 | 220 | 340 | 420 | 481 | 499 | 514 | 526 | 547 | 558 | 596 |
| Tamil Nadu | 31895 | 40491 | 66207 | 79122 | 85314 | 92354 | 102234 | 154781 | 164370 | 187233 | 201456 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tripura | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| Uttaranchal | 0 | 0 | 2130 | 2290 | 2395 | 2475 | 2548 | 2684 | 2717 | 2796 | 3102 |
| Uttar Pradesh | 12886 | 16896 | 18471 | 22491 | 27841 | 32145 | 37463 | 43691 | 47568 | 51472 | 55304 |
| West Bengal | 5077 | 7157 | 8539 | 10709 | 11234 | 11876 | 12541 | 12963 | 13587 | 14586 | 15237 |
| **India** | **185758** | **226560** | **295796** | **359721** | **423125** | **487963** | **541202** | **597631** | **647238** | **697312** | **778412** |

Source:All India Council for Technical Education (AICTE),2012-2015

# Appendix V

## State Wise Approved Intakes,Enrolled Students and Percentage of Seats in Engineering Colleges in India (2013-2015).

| States/UTs | 2012-13 | | | 2013-14 | | | 2014-15 | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Approved Intake*** | **Enrolled Students** | **Seats Filled Percentage** | **Approved Intake*** | **Enrolled Students** | **Seats Filled Percentage** | **Approved Intake*** | **Enrolled Students** | **Seats Filled Percentage** |
| Andaman and Nicobar Islands | 90 | 93 | 100 | 90 | 94 | 100 | 90 | 91 | 100 |
| Andhra Pradesh | 189825 | 98682 | 52 | 186135 | 94679 | 51 | 198120 | 91690 | 46 |
| Arunachal Pradesh | 150 | 0 | 0 | 150 | 0 | 0 | 0 | 0 | 0 |
| Assam | 4515 | 2728 | 60 | 5115 | 2840 | 56 | 5475 | 2529 | 46 |
| Bihar | 8000 | 4712 | 59 | 8780 | 4812 | 55 | 8960 | 4134 | 46 |
| Chandigarh | 1041 | 948 | 91 | 1025 | 924 | 90 | 1041 | 1006 | 97 |
| Chhattisgarh | 25906 | 13857 | 53 | 27736 | 13939 | 50 | 29206 | 11665 | 40 |
| Dadra and Nagar Haveli | 60 | 60 | 100 | 60 | 60 | 100 | 60 | 59 | 98 |
| Delhi | 8152 | 7312 | 90 | 9963 | 7393 | 74 | 9981 | 8035 | 81 |
| Goa | 1430 | 1345 | 94 | 1430 | 1201 | 84 | 1430 | 1199 | 84 |
| Gujarat | 61164 | 47880 | 78 | 67224 | 54123 | 81 | 75504 | 50174 | 66 |
| Haryana | 69054 | 30757 | 45 | 72068 | 27337 | 38 | 72644 | 25801 | 36 |
| Himachal Pradesh | 9250 | 3797 | 41 | 11560 | 4016 | 35 | 10900 | 3335 | 31 |
| Jammu and Kashmir | 2485 | 1803 | 73 | 2725 | 1960 | 72 | 2980 | 2163 | 73 |
| Jharkhand | 6030 | 4385 | 73 | 6120 | 4497 | 73 | 7590 | 4750 | 63 |
| Karnataka | 101608 | 76695 | 75 | 106448 | 80970 | 76 | 111062 | 85735 | 77 |
| Kerala | 59526 | 42782 | 72 | 61612 | 44091 | 72 | 66656 | 43466 | 65 |
| Madhya Pradesh | 107009 | 71709 | 67 | 115982 | 63639 | 55 | 115838 | 54175 | 47 |
| Maharashtra | 168545 | 119776 | 71 | 176693 | 117015 | 66 | 178310 | 103787 | 58 |
| Manipur | 115 | 115 | 100 | 115 | 115 | 100 | 115 | 115 | 100 |
| Meghalaya | 480 | 284 | 59 | 480 | 140 | 29 | 480 | 257 | 54 |
| Mizoram | 30 | 31 | 100 | 30 | 31 | 100 | 30 | 35 | 100 |
| Nagaland | 0 | 0 | 0 | 240 | 0 | 0 | 240 | 0 | 0 |
| Odisha | 45503 | 23550 | 52 | 46367 | 20678 | 45 | 49499 | 17788 | 36 |
| Puducherry | 6810 | 4560 | 67 | 7710 | 4512 | 59 | 9150 | 4438 | 49 |
| Punjab | 46784 | 23481 | 50 | 49644 | 22865 | 46 | 53122 | 20774 | 39 |
| Rajasthan | 65216 | 35597 | 55 | 67605 | 32633 | 48 | 70800 | 27975 | 40 |
| Sikkim | 786 | 656 | 83 | 786 | 650 | 83 | 906 | 651 | 72 |
| Tamil Nadu | 260302 | 177344 | 68 | 283715 | 177110 | 62 | 294484 | 161756 | 55 |
| Telangana | 192311 | 94779 | 49 | 198445 | 91057 | 46 | 209530 | 84050 | 40 |
| Tripura | 300 | 215 | 72 | 300 | 178 | 59 | 630 | 331 | 53 |
| Uttar Pradesh | 158642 | 86858 | 55 | 167641 | 82519 | 49 | 166596 | 80649 | 48 |
| Uttarakhand | 15734 | 7499 | 48 | 16274 | 6235 | 38 | 14874 | 5737 | 39 |
| West Bengal | 35588 | 25294 | 71 | 37258 | 24504 | 66 | 40768 | 21253 | 52 |
| India | **1652441** | **1009584** | **61** | **1737526** | **986817** | **57** | **1807071** | **919603** | **51** |

Source:All India Council for Technical Education (AICTE),2012-2015

# Appendix VI

## Total Branch wise Intakes of Engineering Colleges in Kerala(2000-2016)

| Branches | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applied Electronics and Instrumentation | 684 | 690 | 758 | 815 | 956 | 981 | 1026 | 1038 | 1145 | 1274 | 1302 | 1387 | 1446 | 1500 | 1370 | 1020 | 960 |
| Agriculture Engineering | 40 | 42 | 43 | 45 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 49 | 49 |
| Architecture | 320 | 320 | 350 | 360 | 366 | 375 | 381 | 360 | 360 | 420 | 463 | 470 | 560 | 761 | 861 | 1120 | 1240 |
| Automobile Engineering | 90 | 120 | 115 | 120 | 120 | 180 | 196 | 200 | 210 | 264 | 320 | 342 | 360 | 420 | 420 | 420 | 600 |
| Bio-medical Engineering | 20 | 40 | 80 | 80 | 80 | 120 | 120 | 140 | 144 | 160 | 180 | 200 | 240 | 240 | 240 | 240 | 240 |
| Bio-Technology | 60 | 90 | 90 | 120 | 120 | 120 | 200 | 220 | 240 | 240 | 280 | 286 | 300 | 300 | 300 | 300 | 300 |
| Civil Engineering | 780 | 953 | 1021 | 1145 | 1687 | 1795 | 1982 | 2024 | 2643 | 2761 | 3496 | 4782 | 6939 | 7959 | 8125 | 10037 | 10412 |
| Chemical Engineering | 30 | 60 | 60 | 60 | 90 | 120 | 120 | 152 | 148 | 156 | 163 | 170 | 173 | 160 | 186 | 290 | 350 |
| Computer science and Engineering | 1020 | 1254 | 1476 | 1517 | 1841 | 1963 | 2431 | 3672 | 4028 | 4697 | 5821 | 6394 | 8777 | 8938 | 9258 | 10005 | 10269 |
| Diary Science and Technology | NA | NA | NA | NA | NA | 20 | 20 | 25 | 25 | 25 | 25 | 25 | 25 | 40 | 40 | 40 | 180 |
| Electronics and Communication | 1035 | 1142 | 1294 | 2563 | 3647 | 4763 | 7124 | 8635 | 9478 | 10024 | 10345 | 10874 | 11002 | 11443 | 11672 | 12045 | 12063 |
| Electrical and Electronics | 956 | 1043 | 1756 | 2083 | 2471 | 3068 | 3455 | 4799 | 5800 | 6914 | 7021 | 7359 | 7572 | 8278 | 8351 | 8755 | 8839 |
| Electronics and Instrumentation | 90 | 90 | 90 | 90 | 100 | 120 | 120 | 120 | 240 | 260 | 280 | 280 | 300 | 330 | 330 | 360 | 360 |
| Food Technology | 30 | 30 | 30 | 30 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 30 | 30 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Instrumentation and Control Engineering | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 100 | 100 | 120 | 120 | 120 | 123 | 120 | 120 | 120 | 120 |
| Industrial Engineering | 30 | 30 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Information Technology | 754 | 883 | 945 | 1027 | 1578 | 1693 | 1745 | 1823 | 2006 | 2018 | 2264 | 2386 | 2730 | 2526 | 2243 | 1815 | 1779 |
| Mechanical(Automobile) | 40 | 40 | 60 | 60 | 60 | 60 | 80 | 80 | 100 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Mechanical Engineering | 1221 | 1225 | 1478 | 1564 | 2587 | 3945 | 5814 | 6491 | 6744 | 7021 | 7118 | 7256 | 7553 | 8653 | 9862 | 10451 | 11165 |
| Mechanical(Production Engineering) | 30 | 60 | 60 | 60 | 60 | 60 | 60 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 120 | 120 | 180 |
| Polymer Engineering | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Production Engineering | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 90 |
| Printing Technology | 90 | 90 | 100 | 100 | 120 | 120 | 120 | 140 | 160 | 200 | 220 | 240 | 240 | 360 | 30 | 30 | 30 |
| Aeronautical Engineering | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 420 |
| Safty and Fire Engineering | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 60 | 60 | 60 |
| Food Engineering | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 60 | 60 | 100 |
| Mechatronics Engineering | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 60 | 60 | 180 |
| Metallurgy | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 60 | 60 | 60 | 60 |
| Naval Architecture and ship Building | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 60 | 60 | 60 |

Source:Economic Review(2000-2016)

# Appendix VII

## Total Branch wise Outturn of Engineering Graduates in Kerala (2000-2016)

| Branches | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applied Electronics and Instrumentation | 285 | 303 | 231 | 449 | 454 | 506 | 622 | 635 | 643 | 688 | 694 | 705 | 946 | 1050 | 710 | 703 | 700 |
| Agriculture Engineering | 21 | 28 | 22 | 34 | 35 | 36 | 38 | 39 | 42 | 42 | 43 | 43 | 44 | 45 | 44 | 44 | 46 |
| Architecture | 342 | 351 | 226 | 398 | 404 | 417 | 525 | 543 | 558 | 573 | 577 | 583 | 524 | 431 | 635 | 732 | 621 |
| Automobile Engineering | 220 | 228 | 214 | 265 | 272 | 285 | 324 | 347 | 361 | 374 | 385 | 391 | 205 | 412 | 436 | 401 | 435 |
| Bio-medical Engineering | 85 | 88 | 86 | 102 | 108 | 117 | 136 | 141 | 153 | 163 | 171 | 180 | 258 | 191 | 181 | 180 | 156 |
| Bio-Technology | 63 | 65 | 67 | 74 | 85 | 96 | 114 | 185 | 194 | 200 | 208 | 217 | 254 | 261 | 254 | 245 | 248 |
| Civil Engineering | 234 | 268 | 244 | 1014 | 1036 | 1215 | 1370 | 1629 | 1829 | 2015 | 2143 | 2176 | 3166 | 3275 | 3160 | 4890 | 2914 |
| Chemical Engineering | 106 | 114 | 103 | 154 | 163 | 184 | 215 | 224 | 248 | 254 | 265 | 278 | 155 | 140 | 271 | 173 | 276 |
| Computer science and Engineering | 668 | 675 | 573 | 812 | 837 | 1021 | 1167 | 1218 | 1398 | 1743 | 2043 | 2350 | 4831 | 3921 | 2845 | 6575 | 2847 |
| Diary Science and Technology | NA | NA | NA | NA | NA | 11 | 10 | 15 | 14 | 10 | 18 | 16 | 20 | 35 | 29 | 31 | 158 |
| Electronics and Communication | 896 | 910 | 538 | 1224 | 1288 | 1415 | 1485 | 1785 | 2085 | 2236 | 2639 | 2701 | 5291 | 5791 | 4779 | 4529 | 4605 |
| Electrical and Electronics | 661 | 722 | 1028 | 916 | 869 | 967 | 1028 | 1168 | 1191 | 1421 | 1680 | 1978 | 2241 | 2374 | 2215 | 1945 | 1920 |
| Electronics and Instrumentation | 80 | 82 | 60 | 92 | 95 | 94 | 100 | 110 | 115 | 120 | 123 | 136 | 182 | 254 | 153 | 234 | 136 |
| Food Technology | 15 | 19 | 16 | 19 | 22 | 24 | 26 | 28 | 29 | 26 | 27 | 24 | 45 | 47 | 26 | 27 | 27 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Instrumentation and Control Engineering | 36 | 42 | 31 | 58 | 63 | 68 | 71 | 75 | 78 | 81 | 83 | 58 | 63 | 98 | 67 | 68 | 67 |
| Industrial Engineering | 14 | 18 | 15 | 26 | 37 | 39 | 45 | 48 | 49 | 51 | 52 | 53 | 30 | 31 | 53 | 51 | 51 |
| Information Technology | 263 | 345 | 140 | 524 | 537 | 584 | 672 | 753 | 744 | 840 | 876 | 878 | 1106 | 1025 | 910 | 1050 | 775 |
| Mechanical(Automobile) | 42 | 44 | 40 | 61 | 73 | 78 | 85 | 92 | 96 | 105 | 116 | 118 | 55 | 117 | 114 | 106 | 108 |
| Mechanical Engineering | 669 | 671 | 981 | 1010 | 1059 | 1478 | 1542 | 1518 | 1589 | 1964 | 2055 | 2061 | 1004 | 2366 | 4266 | 5820 | 4055 |
| Mechanical(Production Engineering) | 36 | 39 | 35 | 58 | 60 | 64 | 70 | 71 | 73 | 74 | 75 | 77 | 87 | 89 | 89 | 89 | 88 |
| Polymer Engineering | 18 | 26 | 19 | 32 | 46 | 48 | 53 | 54 | 56 | 57 | 57 | 58 | 69 | 78 | 58 | 58 | 57 |
| Production Engineering | 14 | 19 | 15 | 48 | 52 | 54 | 57 | 59 | 62 | 63 | 64 | 66 | 127 | 112 | 67 | 69 | 69 |
| Printing Technology | 18 | 24 | 17 | 19 | 21 | 24 | 25 | 26 | 27 | 27 | 27 | 27 | 27 | 27 | 26 | 27 | 28 |
| Aeronautical Engineering | 40 | 38 | 42 | 45 | 46 | 48 | 50 | 52 | 53 | 54 | 58 | 56 | 58 | 60 | 58 | 60 | 306 |
| Safty and Fire Engineering | 39 | 31 | 36 | 49 | 54 | 56 | 56 | 56 | 56 | 54 | 55 | 55 | 56 | 56 | 55 | 54 | 54 |
| Food Engineering | 30 | 32 | 31 | 78 | 83 | 85 | 86 | 88 | 89 | 90 | 89 | 90 | 28 | 25 | 92 | 93 | 92 |
| Mechatronics Engineering | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 42 | 40 | 43 |
| Metallurgy | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 52 | 51 | 52 | 44 |
| Naval Architecture and ship Building | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 50 | 51 | 52 |

Source: Economic Review (2000-2016)