BUSINESS STATISTICS AND ANALYTICS FOR DECISION MAKING

SCHOOL OF BUSINESS MANAGEMENT

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Anurag Group of Institutions

School of Business Management

Course Name : Business Statistics and Analytics for Decision Making

Course Number : A93002

Course Designation : Core

Credits : 4

I MBA – I Semester

(2019-20)

Name of Faculty	Academic Year/Regulation
Dr. G. Sabitha	2019-20/R18

SYLLABUS

Unit – I	**Sampling:** Primary Data and Secondary Data Collection Techniques, Questionnaire Design. Tabulation of data and general rules of Tabulation. Diagrammatic and Graphical presentation of data.
Unit – II	**Measures of Central Tendency:** Measures of Dispersion, Measures of Skewness and Interpretation, Correlation and Regression Analysis, Method of Least squares. Types of Correlation and their specific applications.
Unit – III	**Statistical Inference:** Introduction to Null hypothesis , Alternative Hypothesis, Tests of Hypothesis, Procedure for Testing of Hypothesis, Tests of significance for small samples, Application, t-Test, ANOVA – One Way and Two Way Classifications with Business Applications.
Unit – IV	**Chi-square test, Association of Attributes and Inferences:** Parametric- Parametric vs. Non-Parametric, Sign Test, Sign Rank Test, Run Test, Median test, McNemar's Test, Kruskal-Wallis Test with Business Applications.
Unit – V	**Time series:** Utility of Time Series, Components, Business Applications, Measurement of Trend through Method of Least Squares, Moving averages, and Graphical methods, Measurement of Seasonal variations.

Text Books	
1	Donald R. Cooper, Pamela S. Schindler: Business Research Methods, TMH, 8/e, 2009
2	Gaur, Statistical Methods for Practice and Research, Sage Publication,2009

Reference Books	
1	Bhandarkar& Wilkinson, Methodology and Techniques of Social Research, Himalaya, 2009
2	Bajpai, Business Statistics, Pearson, 2009
3	Richard I Levin & David S.Rubin, Statistics for Management, Pearson, 7/e, 2008

MBA PROGRAM EDUCATIONAL OBJECTIVES (PEO's):

1. To teach the fundamentals of the key elements of a business organization.

2. To provide a critical perspective on theoretical knowledge and practical approach to various functional areas of management and decision making.

3. To develop analytical skills to identify the link between the management practices in the functional areas of an organization and business environment.

4. To establish and realize a creative research culture among the student community.

5. To provide insights on latest technology, business communication, management concepts and to build team work and leadership skills within them.

6. To inculcate the habit of inquisitiveness and creativeness aimed at self-actualization and realization of ethical practices.

PROGRAM LEARNING OUTCOMES (PO's):

The learning outcomes specify the knowledge, skills, values and attitudes students are expected to attain in courses or in a program.

1. *Business Environment and Domain Knowledge*: Graduates are able to improve their awareness sand knowledge about functioning of local and global business environment and society.

2. *Critical thinking, Business Analysis, Problem Solving and Innovative Solutions:* Graduates are expected to develop skills on analysing the business data, application of relevant analysis, and problem solving in other functional areas such as marketing, business strategy and human resources.

3. *Global Exposure and Cross-Cultural Understanding*: Demonstrate a global outlook with the ability to identify aspects of the global business and Cross Cultural Understanding.

4. *Social Responsiveness and Ethics:* Graduates are expected to identify the contemporary social problems, exploring the opportunities for social entrepreneurship, designing business solutions and demonstrate ethical standards in organizational decision making.

5. *Effective Communication*: Graduates are expected to develop effective oral and written communication especially in business applications, with the use of appropriate technology.

6. *Leadership and Teamwork*: Graduates are expected to collaborate and lead teams across organizational boundaries and demonstrate leadership qualities, maximize the usage of diverse skills of team members in the related context.

Course Objective: To enable students to analyze & apply various Statistical Techniques for Business Decision Making

Course Outcomes: At the end of the course the students able to

1. Demonstrate the Collection & Presentation skills of Data
2. Solve the problems related to Correlation & Regression Analysis
3. Apply relevant techniques for solving problems.
4. Make use of Parametric & Non-Parametric Techniques for Problem Solving.
5. Apply Time Series & Other measure for Analyzing Trends.

Definitions	I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Verbs	• Choose • Define • Find • How • Label • List • Match • Name • Omit • Recall • Relate • Select • Show • Spell • Tell • What • When • Where • Which • Who • Why	• Classify • Compare • Contrast • Demonstrate • Explain • Extend • Illustrate • Infer • Interpret • Outline • Relate • Rephrase • Show • Summarize • Translate	• Apply • Build • Choose • Construct • Develop • Experiment with • Identify • Interview • Make use of • Model • Organize • Plan • Select • Solve • Utilize	• Analyze • Assume • Categorize • Classify • Compare • Conclusion • Contrast • Discover • Dissect • Distinguish • Divide • Examine • Function • Inference • Inspect • List • Motive • Relationships • Simplify • Survey • Take part in • Test for • Theme	• Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Criteria • Criticize • Decide • Deduct • Defend • Determine • Disprove • Estimate • Evaluate • Explain • Importance • Influence • Interpret • Judge • Justify • Mark • Measure • Opinion • Perceive • Prioritize • Prove • Rate • Recommend • Rule on • Select • Support • Value	• Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Delete • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Happen • Imagine • Improve • Invent • Make up • Maximize • Minimize • Modify • Original • Originate • Plan • Predict • Propose • Solution • Solve • Suppose • Test • Theory

MAPPING OF COURSE OUT COMES WITH PO's & PEO's

Course Outcomes	PO's	PEO's
CO1	1,2,5	1,2,4,6
CO2	1,2,5	2,3,4,6
CO3	1,2,5	2,3,4,6
CO4	1,2,5	2,3,4,6
CO5	1,2,5	2,3,4,6

Articulation matrix of Course outcomes with PO's

	Program Outcomes						Program Educational Objectives					
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	PEO 6
CO1	2	3	-	-	2	-	2	2	-	3	-	2
CO2	2	3	-	-	2	-	-	3	2	3	-	2
CO3	2	3	-	-	2	-	-	3	2	3	-	2
CO4	2	3	-	-	2	-	-	3	2	3	-	2
CO5	2	3	-	-	2	-	-	3	2	3	-	2

Course Schedule

Distribution of Hours in Unit – Wise

Unit	Topic	Chapters	Total No. of Hours
I	Introduction	TB2:1,2,3,4,6,7,8,12,15,17 RB1:9,11,12,18,26 RB2: 1,2,8 RB3: 2,6	12
II	Measures of Central Tendency	TB1: 3,7,8,9 TB2:19,20 RB1:18 RB2: 3,4,14,15 RB3: 3,12,13	14
III	Statistical Inference	TB1: 2,4,5,6 TB2:18 RB1:18 RB2: 9,10,11,12,13 RB3: 8,9,11	13
IV	Parametric Vs Non-parametric	RB1:9,11,12,18,26 RB2: 18 RB3: 14	10
V	Time Series	RB1:9,11,12,18,26 RB2: 16 RB3: 15	12
Total classes for Syllabus coverage			**61**
Including Tutorial Classes (1 per week)			

TB1: Text Book 1; TB2: Text Book 2
RB1: Reference Book 1 and so on

Other suggested books:

1. SC Gupta, Indra Gupta, Business Statistics, Himalaya Publishing, 2007.
2. Sharma, Business Statistics, Pearson, 2009
3. J K Sachdev, Business Research methodology, Himalaya Publishing, 2009.

Lecture Plan

S. No.	Topic	No of Lecture Hours	Teaching Learning Process
UNIT-1: Introduction			
1	Introduction to Business, Statistics Analysis and Decision Making, Importance	1	Chalk & Board
2	Sampling	1	Chalk & Board
3	Primary and Secondary Data Collection Techniques	1	Case study
4	Questionnaire Design	1	Practical
5	Tutorial (Questionnaire Collection)	1	Assignment
6	Tabulation of Data and General Rules	2	Problems
7	Diagrammatic Representation of Data	2	Activity using Excel
8	Graphical Representation of Data	2	Activity using Excel
9	Tutorial (Representation of Data)	1	Assignment
	Total Class hours required for Unit 1	**12**	
UNIT-2: Measures of Central Tendency			
1	Measure of Dispersion	2	Problems
2	Measures of Skewness and Interpretation	2	Problems
3	Correlation	2	Problems
4	Tutorial	1	Assignment
5	Regression	3	Problems
6	Methods of Least Squares	3	Problems
7	Tutorial	1	Case study
	Total Class hours required for Unit 2	**14**	
UNIT-3: Statistical Inference			
1	Hypothesis tests and Procedures	1	Chalk & Board
2	T- Test	2	Problems
3	ANOVA-One Way	2	Problems
4	Tutorial	1	Case Study

5	ANOVA-Two Way	3	Problems
6	Chi Square Tests	3	Problems
7	Tutorial	1	Case Study
	Total Class hours required for Unit 3	**13**	

Unit-4: Parametric Vs Non-Parametric

1	Sign Test	1	Problems
2	Sign Rank Test	1	Problems
3	Run Test	2	Problems
4	Tutorial	1	Case Study
5	Median Test	1	Problems
6	Mc'Nemar's Test	1	Problems
7	Kruskal-Wallis Test	2	Problems
8	Tutorial	1	Case Study
	Total Class hours required for Unit 4	**10**	

Unit-5: Time Series

1	Utility of Time Series, Components, Business Applications	1	Chalk & Board
2	Method of Least Squares	3	Problems
3	Moving Averages	2	Problems
4	Tutorial	1	Case Study
5	Measurement of Seasonal Variation	4	Problems
6	Tutorial	1	Case Study
	Total Class hours required for Unit 5	**12**	
Total contact classes for Syllabus coverage : 61			

Minutes of Course Review Meeting

Details of Meeting No -	
Date of Meeting	
Member's Present	
Signature of Member's	
Remarks	

Details of Meeting No -	
Date of Meeting	
Member's Present	
Signature of Member's	
Remarks	

Details of Meeting No -	
Date of Meeting	
Member's Present	
Signature of Member's	
Remarks	

Unit-1

Short questions:

1. Explain the concept of Statistics (L2, CO1)
2. Explain Primary Data (L2, CO1)
3. Explain Secondary Data (L2, CO1)
4. Briefly explain the principles of Classification (L2, CO1)
5. Discuss the Frequency Distribution. (L2, CO1)
6. A College Management wanted to give scholarships to MBA students securing 70% and above marks. The marks of 25 students who were eligible for scholarship are:
   74,62,84,52,62,75,85,67,80,55, 58, 67,74,81,65,78,82,78,56,58,76,73,55,58,68. Monthly scholarships are:

%of Marks	Monthly Scholarship (in Rs.)
55-60	250
61-65	300
66-70	350
71-75	400
76-80	450
81-85	500

Calculate the monthly scholarship paid to the students. (L6, CO1)

7. The weekly observations on cost of living index in a certain city for the year 2018-19 are given below:

   Cost of living Index: 140-150   150-160   160-170   170-180

   No. of workers: 5   10   20   9
8. Prepare 'less than' and 'more than' cumulative frequency distributions. (L6, CO1)
9. Discuss the discrete variable and continuous variables with 4 examples each. (L4,CO1)
10. Explain briefly about the Types of Questions. (L3, CO1)

Long questions:

1. If you are appointed to conduct a statistical enquiry, describe in general what steps will you be taking from the stage of appointment till the presentation of your report. (L5, CO1)
2. Distinguish between Primary and Secondary data and discuss the various methods of collecting Primary Data. (L3, CO1)
3. What are the essentials of a good questionnaire? Draft a suitable questionnaire to enable you to study the effects of super markets on prices of essential consumer goods. (L6, CO1)
4. Discuss the Origin and Development of Statistics. (L2, CO1)
5. *Problems on* presenting the given data in tabular form (L6, CO1)
6. What are the considerations to be taken into account in the construction of a table? Construct a table showing the profits of a company for a period of 5 years with imaginary figures? (L5, CO1)

7. Describe the advantages of diagrammatic representation of statistical data. Name the different types of diagrams commonly used and mention the situations where the use of each type of diagram would be appropriate. (L4, CO1)
8. *Problems on* presenting the data in diagrams. (L6, CO1)

Unit-2:

Short questions:

1. List out various measures of Dispersion. Also Discuss the Absolute and Relative Measure (L2, CO2)
2. Short problems on various measures of Dispersion. (L6, CO2)
3. Explain the concept of negative and positive skewness. (L2, CO2)
4. Short Problems on skewness. (L6, CO2)
5. Discuss the different methods of Correlation. (L2, CO2)
6. Problems on Correlation. (L6, CO2)
7. Explain the concept of Regression and point out its usefulness in dealing with business problems. (L2, CO2)
8. Problems related equation of regression. (L6, CO2)
9. Problems on Correlation Coefficient. (L6, CO2)

Long questions:

1. Problems on various measures of Dispersion. (L6, CO2)
2. Problems on skewness. (L6, CO2)
3. Problems on Correlation. (L6, CO2)
4. Problems related equation of regression. (L6, CO2)
5. Comment on "regression Equations are irreversible"
6. Distinguish between Correlation and Regression. (L2, CO2)
7. Explain the terms: (i) Coefficient of Non-determination and (ii) Coefficient of Alienation and give their physical interpretation
8. Discuss the statistical validity of the following statements: (a) "High Positive coefficient Correlation between increase in the sale of a newspaper and increase in the number of crimes, leads to the conclusion that newspaper reading may be responsible for the increase in the number of crimes" (b). "A high positive value of 'r' between the increase in cigarette smoking and increase in lung cancer establishes that cigarette smoking is responsible for lung cancer" (L6, CO2)
9. Elucidate "Average, dispersion, skewness and kurtosis used in connection with the frequency distribution of a continuous distribution" (L6,CO6)

Unit-3:

Short questions:

1. Explain how hypothesis testing is important (L2, CO3)
2. Establish null and alternative hypotheses about a population parameter (L6, CO3)
3. Develop hypothesis testing methodology for accepting or rejecting null hypothesis (L6, CO3)
4. Discuss the Type I and Type II errors and its implications in making a decision (L3, CO3)
5. Interpret the confidence level, the significance level and the power of a test. (L6, CO3)
6. Discuss the advantages and disadvantages of non-parametric statistical tests. (L2, CO3)
7. Discuss 'ANOVA' for equality of three or more population means (L2, CO3)
8. Summarize F-ration in the form of an 'ANOVA' table (L3, CO3)

Long questions:

1. Problems on t-test. (L6, CO2)
2. Problems on z test. (L6, CO2)
3. Problems on F test. (L6, CO2)
4. Problems on computation of p-values. (L6, CO2)
5. Problems on test significant association between categorical variables. (L6, CO3)
6. Problems on 'ANOVA' one way (L6, CO3)
7. Problems on 'ANOVA' two way (L6, CO3)
8. Discuss how F distribution related to the student's t distribution and the chi-square distribution? (L3, CO3)
9. Discuss the components of total variation when samples are selected in blocks. (L3, CO3)

Unit-4:

Short questions:

1. Discuss the Sign test with a business application (L4, CO4)
2. Discuss the Sign Rank Test with a business application (L4, CO4)
3. Discuss the Run Test with a business application (L4, CO4)
4. Discuss the Median Test with a business application (L4, CO4)
5. Discuss the McNemar's test with a business application (L4, CO4)
6. Discuss the Kruskal-Wallis Test with a business application (L4, CO4)

Long questions:

1. Problems on the Sign test (L6, CO4)
2. Problems on Sign Rank Test (L6, CO4)
3. Problems on Run Test (L6, CO4)
4. Problems on Median Test (L6, CO4)
5. Problems on McNemar's test (L6, CO4)
6. Problems on Kruskal-Wallis Test (L6, CO4)

Unit-5:

Short questions:

1. Explain the judgmental forecasting model and when it is appropriate (L2, CO4)
2. What is the advantage of reducing a time series into its four components?
3. What are the advantages and disadvantages of trend analysis (L2, CO4)
4. Under what circumstances can a trend equation be used to forecast a value in a series in the future. Explain. (L2, CO4)
5. Problem on simple average method (L6, CO4)
6. Problems on Time Series Analysis (L6, CO4)
7. Problems on Moving Averages (L6, CO4)
8. Problems on trend line method (L6, CO4)

Long questions:

1. Identify the classical components of a time series and indicate how each is accounting for forecasting (L4, CO4)
2. Problems on Time Series Analysis (L6, CO4)
3. Problems on Moving Averages (L6, CO4)
4. Problems on trend line method (L6, CO4)
5. Distinguish between trend, seasonal variations and cyclical variations in a time-series, how can trend be isolated from variations? (L3, CO4)
6. Explain the methods of fitting for the quadratic and exponential curves. How would you use the fitted curves fir forecasting. (L3, CO4)

ANURAG GROUP OF INSTITUTIONS
(Formerly CVSR college of Engineering)
Venkatapur (v), Ghatkesar (M), R.R. Dist.
Sub: Business Statistics and Analytics for Decision Making

Model Question paper

Section A
Answer all the following
Each carries 5 marks

1. Discuss the various methods of Sampling Techniques.
2. Explain the different types correlations
3. Differentiate Null Hypothesis and Alternative Hypothesis
4. Distinguish between Parametric and Non-Parametric tests
5. Discuss the methods of measurement of seasonal variations

Section B
Answer the following

6. a) Design a questionnaire to survey the interest of the students in attending the value added courses which are not part of the curriculum.

(OR)

   b) Represent the collected data of qn 6(i) in diagram and graphical method?

7. a) Problem on Regression analysis.

(OR)

   b) Problem on methods of least squares

8. a) Discuss the application methods of ANOVA one-way and two-way.

(OR)

   b) Problem on Chi square

9. a) Problem on Parametric tests.

(OR)

   b) Problem on Non-parametric tests.

10. a) Problem on Moving averages

(OR)

   b) Write a short note on (a) Time Series (b) Least Squares (c) Graphical methods

Case studies:

Unit 1: Introduction:

Data from any official website will be given and ask the students to present it in diagrammatic and graphical representation and interpret.

Unit 2: Measures of Central Tendency:

   i.   Case Study Researchers explored the crying of infants four to ten days old and their IQ test scores at age three to determine if more crying was a sign of higher IQ.

   ii.   Case Study Researchers explore Linear Regression And Correlation Analysis Of Water Quality Parameters of any project/ village

Unit 3: Statistical Inference:

   i.   For demonstrating the power of chi-square test we use cross tabulations (Table B.7) from open source book (technical report): http://fas.org/sgp/library/spies.pdf

    Problem

    We want to estimate association between the job occupied (civilian, military) and the source of recruitment (volunteer, intelligence, family) that is declared strong by the author of this book. In fact this table can be used as is for chi-square test but we will use chisq.test and barplot R-functions to prove or reject this hypothesis.

   ii.   The Elementary Statistics for Medical Students (ESMS) project

    This project aims to strengthen the statistical skills for Medical students in Vietnam. We provide the problem-based tutorials, each one will show the student how to resolve a study question using the appropriate methods. We focus on the basic statistical methods and common tasks All tutorials will be based on R, not only because this is a great tool for data visualization and analysis, but also for encouraging the students to use a free software instead of using the pirated packages like SPSS or Medcalc. Through these tutorials you will realize that R is much more powerful than any commercial package you ever know.

    Introduction

    The one-way analysis of variance (ANOVA) is an omnibus statistical method for verifying whether statistically significant differences exist between the means of independent groups. It worth to mention that the ANOVA is based on a linear model (LM), so our true intention is to evaluate the "effect" of a multi-levels factor on the outcome. Further analysis such as pairwise comparison or planned contrast would also be required for verifying our hypothesis, because stand alone ANOVA cannot locate which specific groups were statistically significantly different from each other.

    This tutorial will show you how to carry out an One-way ANOVA in R. We also suggest some popular techniques for pairwise comparison, including Tukey post-hoc test, Bonferroni adjustment and planned contrast analysis. Last but not least, we also introduce

some bootstraping procedures for ANOVA and post-hoc test, as well as how to interpret and report the results.

Context

In this parrallel group clinical trial, 606 patients were randomized into 4 treatment groups (A,B,C and D). Each group was treated with a different dose of drug X (A=lowest, D=highest). All patients underwent a liver function test before and after the treatment. The outcomes include Alkaline phosphatase, Alanine aminotransferase, Aspartate aminotransferase and Total bilirubin levels. For this tutorial we will only focus on the Total bilirubin level (TBL). Our study question is whether the drug doses have an effect on post-treatment TBL level?

Unit 4: Parametric and Non-Parametric Test:

Statistical Comparisons by Means of Non-Parametric Tests: A Case Study on Genetic Based Machine Learning

Unit 5: Time Series:

Manufacturing Case Study Example

Power Horse, a tractor and farm equipment manufacturing company, was established a few years after World War II. The company has shown a consistent growth in its revenue from tractor sales since its inception. However, over the years the company has struggled to keep it's inventory and production cost down because of variability in sales and tractor demand. The management at Power Horse is under enormous pressure from the shareholders and board to reduce the production cost. Additionally, they are also interested in understanding the impact of their marketing and farmer connects efforts towards overall sales. In the same effort, they have hired you as a data science and predictive analytics consultant.

Investigate this problem

ACTIVITIES: Discussions/presentations on

Unit 1: Introduction: Asking the students to collect online survey tools

A situation will be given to prepare a questionnaire

Graphical method using Excel

Unit 2: Measures of Central Tendency: An analysis on correlation using a Case

An analysis on Regression using a Case

Unit 3: Statistical Inference: An analysis using Chi-square, ANOVA one-way and Two-way

Unit 4: Parametric and Non-Parametric Test: Study on Non-Parametric test

Unit 5: Time Series: Time Series, Moving averages analysis of official data collected from Govt. websites.

Tutorial Sheet

Unit-I   Topics Revised
Topic Name
Preparation of a Questionnaire
Diagrammatic and Graphical representation of a data

Unit-I   Topics Revised
Topic Name
Correlation and Regression
Methods of Least Sqaures

Unit-III   Topics Revised
Topic Name
ANOVA two way
Chi Sqaure

Unit-IV   Topics Revised
Topic Name
Revision of Sign, Rank Sign test and Run test
Revision of Median, McNemar's and Kruskal-Wallis Tests

Unit-V Topics Revised
Topic Name

Time Series and Moving Averages

Course Assessment Report

Batch:

Academic Year/Sem:

Course Name:

Course Number:

Course Attainment (75% of Direct + 25% of Indirect) on a scale of 1 to 3.

Remarks and suggestions:

Course Coordinator

Direct Course Assessment Sheet (As per IonCudos)

a) Internal Examination

Course assessment sheet Ass1

Hall Ticket No	S1	S2	TOT
1			
2			
3			

Course assessment sheet Mid1

Hall Ticket No	S1	S2	S3	S4	S5	L1	L2	L3	L4	L5	TOT
1											
2											
3											

Course assessment sheet Ass2

Hall Ticket No	S1	S2	TOT
1			
2			
3			

Course assessment sheet Mid2

Hall Ticket No	S1	S2	S3	S4	S5	L1	L2	L3	L4	L5	TOT
1											
2											
3											

b) External Examination

Hall Ticket No	Total Marks

CSP Rubric

S.No.	Criteria	LEVEL (Level: 3-Excellent Level: 2-Good Level: 1-Poor)	
1	Oral Communication	3	Student speaks in phase with the given topic confidently using Audio-Visual aids. Vocabulary is good
		2	Student speaking without proper planning, fair usage of Audio-Visual aids. Vocabulary is not good
		1	Student speaks vaguely not in phase with the given topic. No synchronization among the talk and Visual Aids
2	Writing Skills	3	Proper structuring of the document with relevant subtitles, readability of document is high with correct use of grammar. Work is genuine and not published anywhere else
		2	Information is gathered without continuity of topic, sentences were not framed properly. Few topics are copied from other documents
		1	Information gathered was not relevant to the given task, vague collection of sentences. Content is copied from other documents
3	Social and Ethical Awareness	3	Student identifies most potential ethical or societal issues and tries to provide solutions for them discussing with peers
		2	Student identifies the societal and ethical issues but fails to provide any solutions discussing with peers
		1	Student makes no attempt in identifying the societal and ethical issues
4	Content Knowledge	3	Student uses appropriate methods, techniques to model and solve the problem accurately
		2	Student tries to model the problem but fails to solve the problem
		1	Student fails to model the problem and also fails to solve the problem
5	Student Participation	3	Listens carefully to the class and tries to answer questions confidently
		2	Listens carefully to the lecture but doesn't attempt to answer the questions
		1	Student neither listens to the class nor attempts to answer the questions
6	Managerial skills	3	The program structure is well organized with appropriate use of technologies and methodology. Code is easy to read and well documented. Student is able to implement the algorithm producing accurate results
		2	Program structure is well organized with appropriate use of technologies and methodology. Code is quite difficult to read and not properly documented. Student is able to implement the algorithm providing accurate results.
		1	Program structure is not well organized with mistakes in usage of appropriate technologies and methodology. Code is difficult to read and student is not able to execute the program
7	Practical Knowledge	3	Independently able to write programs to strengthen the concepts covered in theory
		2	Independently able to write programs but not able to strengthen the concepts learned in theory
		1	Not able to write programs and not able to strengthen the concepts learned in theory

8	Understanding of Engineering core	3	Student uses appropriate methods, techniques to model and solve the problem accurately in the context of multidisciplinary projects
		2	Student tries to model the problem but fails to solve the problem in the context of multidisciplinary projects
		1	Student fails to model the problem and also fails to solve the problem in the context of multidisciplinary projects

Indirect Course Assessment Sheet

Tools:

   a) Case Study

S.No.	Hall Ticket Number	Rubric Assessment
1		
2		
3		

   b) Course End Survey Report

Add-ons (Guest Lecture/Video Lecture/Certification/Training Program/Poster Presentation…. etc.)

    1. Poster Presentation
    2. Rank Sheet Certification

Unit Wise PPT's & Lecture Notes

_____*********____