DSQT7001	**Quantitative Methods**	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Graduate from any discipline				
Co-requisites	--				

Course Objectives

- Understand relevance & need of quantitative methods for making business decisions
- Demonstrate a sound knowledge of fundamentals of statistics and statistical techniques
- Be able to read and interpret statistical information
- Be able to perform statistical analysis
- Be able to apply quantitative methods to solve a variety of business problems

Course Outcomes

On completion of this course, the students will be able to

- Understand various quantitative & statistical methods
- Understand data and draw inference from data
- Calculate and interpret statistical values by using statistical tool (correlation & regression)
- Demonstrate an ability to apply various statistical tool to solve business problem

Catalog Description

Provides students with quantitative skills that are required to make business decisions. These skills involve using statistical, forecasting and estimation techniques. Formulation and application of mathematical models in business decision making scenarios.

Course Content

Unit I: **7.5 lecture hours**
Function and Progression

Function
- Introduction to Function
- Types of Function
- Evaluating Function through their graph
- Average rate of change of function

Progression
- Arithmetic Progression
- Geometric Progression
- Sum of a series in A.P. and G. P.

Unit II: **3 lecture hours**

Introduction to Statistics

•   Meaning and Scope

- Statistical Methods
- Limitations of Statistical Method
- Introduction to Descriptive and Inferential Statistics

Unit III: 4.5 lecture hours
Data Representation

Frequency Distribution
- Variable
- Arrangement of Raw Data
- Essential for Preparation of Frequency Distribution
- The Relative and Cumulative Frequency Distribution

Tabulation and Graphical Representation
- Table components
- Types of Tabulation
- Type of Graphs
- Frequency Curve
- Cumulative Frequency Curve(Ogive)
- Histogram
- Bar chart
- Types of Bar Chart
- Line Chart
- Pie- Chart

Unit IV: 6 lecture hours

Measure of Central Tendency and Measure of Dispersion

Averages
- Arithmetic Mean or Averages
- Median
- Mode
- Geometric Mean
- Harmonic Mean

Dispersion
- Range
- Mean Deviation
- Standard Deviation
- Coefficient of Variation

Graphical Dispersion
- Skewness
- Kurtosis

Unit V: 9 lecture hours
Probability and Probability Distribution

Probability
- Various types of Events
- Axiomatic Definition of Probability
- Additive and Multiplicative Law of Probability
- Conditional Probability

Probability Distribution
- Binomial Distribution
- Poisson Distribution
- Normal Distribution

Unit VI: **6 lecture hours**
Correlation and Regression

Correlation
- Introduction
- Scatter Diagram
- Karl Pearson's Coefficient of Correlation
- Correlation for Bivariate Frequency Distribution
- Spearman's Rank Correlation
- Repeated Rank Correlation
- Standard error and Probable error

Regression
- Line of Regression
- Fitting of line
- Prediction of Dependent Variable

Text Books

Levin, Richard I.,Rubin, David S., Siddiqui, M.H. and Rastogi, Sanjay(2017),Statistics for Management, Pearson, ISBN: 978-9332581180.

Reference Books

Beri, G.C.,(2005),Business Statistics, TMH Publication, ISBN: 9780070599468.

Gupta and Kapoor (2014), Fundamentals of Applied Statistics, Sultan Chand & Sons, ISBN: 978-8180547058.

Arulmozhi ,G. and Muthulakshmi ,S(2009),Statistics for Management, The McGraw-Hill Education, ISBN: 9780070153684.

Gupta and Kapoor, (2002), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, ISBN: 81-7014-791-3.

Medhi,J.(2013),Statistical Methods-An Introductory Text,New Age International Publishers, ISBN: 978-81-224-1957-3.

Modes of Evaluation: Quiz/Assignment/ presentation/ Project / Written Examination
Examination Scheme:

Components	Individual Assignment / Case lets (Written)	Class Test	Viva–voce: Presentation of project work	ESE
Weightage (%)	15	15	20	50

Program Outcomes (POs)

1. Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions.
2. Students will demonstrate effective application capabilities of their conceptual understanding to infrastructure planning, development and management.
3. Students will be able to exhibit effective decision-making skills, employing analytical and critical thinking ability for planning, development and management of soft and hard infrastructure.
4. Students will demonstrate effective oral and written communication skills in the professional context.
5. Students will be able to work effectively in teams and demonstrate team-working capabilities.
6. Students will exhibit leadership and networking skills.
7. Students will demonstrate sensitivity towards ethical and moral issues and have ability to address them in the context of urban planning, development and management including cost effective financing and good governance.
8. Students will demonstrate employability traits in line with the needs of changing hard and soft urban infrastructure sector.
9. Students will demonstrate strong conceptual knowledge and execution in soft and hard infrastructure planning, development, management, financing, regulation and governance.
10. Students will demonstrate effective understanding of infrastructure planning and development, utility & energy management, urban transportation including metro rail, e-vehicle with charging and other modes of urban surface transportation, water supply and sewerage, smart city planning and effective financing urban infrastructure.
11. Students will demonstrate analytical skills to understand issues with remedial solutions relating to urban infrastructure.
12. Students will exhibit the ability to integrate planning, construction & development, operation & management, financing, regulation and governance of urban infrastructure projects and facilities.
13. Students will exhibit the ability to integrate technical, economic, social and regulatory frameworks for urban infrastructure sector planning and resource management.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand various quantitative & statistical methods	**PO1,2,3,8,9**
CO2	Understand data and draw inference from data	**PO1,3,8,10,11,13**
CO3	Calculate and interpret statistical values by using statistical tool (correlation & regression)	**PO1,2,3,8,12,13**
CO4	Demonstrate an ability to apply various statistical tool to solve business problem	**PO1,2,3,4,7,8,13**

Program Outcome / Course Outcome mapping

Course Outcomes	CO 1	CO 2	CO 3	CO 4
PO 1	3	3	3	3
PO 2	3		3	3
PO 3	3	3	3	3
PO 4				3
PO 5				
PO 6				
PO 7				3
PO 8	2	2	3	3
PO 9	2			
PO 10		3		
PO 11		2		
PO 12			3	
PO 13		3	3	3

Course Code	Course Title	PO1 Students will be able to develop and evaluate alternate managerial choices and	PO2 Students will demonstrate effective application capabilities of their conceptual	PO3 Students will be able to exhibit effective decision-making skills employing analytical	PO4 Students will demonstrate effective oral and written communication skills in the	PO5 Students will be able to work effectively in teams and demonstrate team-working	PO6 Students will exhibit leadership and networking skills	PO7 Students will demonstrate sensitivity towards ethical and moral issues and have	PO8 Students will demonstrate sensitivity towards ethical and moral issues and have	PO9 Students will demonstrate strong conceptual knowledge and execution in	PO10 Students will demonstrate effective understanding of infrastructure planning	PO11 Students will demonstrate analytical skills to understand issues with remedial	PO12 Students will exhibit the ability to integrate planning construction & development	PO13 Students will exhibit the ability to integrate technical economic social and regulatory
DSQT 7001	QM	3	2	3	1			1	3	1	1	1	1	2

1=weakly mapped
2= moderately mapped
3=strongly mapped

Master's-Level Programs

In master's-level programs, knowledge of the key content areas and functional disciplines of business is assumed. Graduates of master's-level programs should acquire a depth of knowledge in these areas that exceeds that of the typical bachelor's degree graduate.
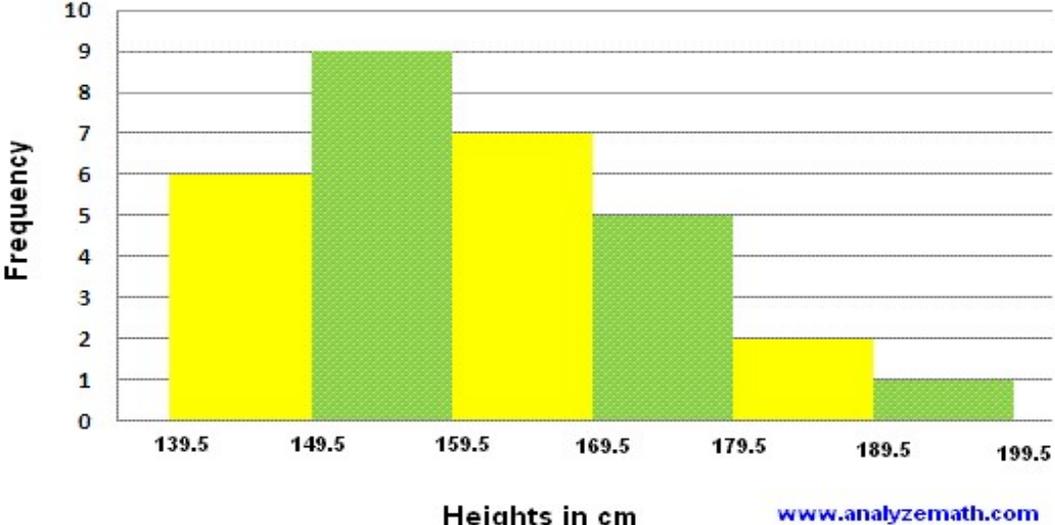
Graduates of master's-level programs in business should be able to:

1. Recognize problems
2. Integrate theory and practice for the purpose of strategic analysis
3. Employ and apply quantitative techniques and methods in the analysis of real-world business situations
4. Identify and analyze the ethical obligations and responsibilities of business

Model Question Paper

Name: Enrolment No:	UPES

Course: DSQT7001 – Quantitative Methods	
Programme: MBA(UISC) Semester: ODD-2017-19 Time: 03 hrs. Max. Marks:100	
Instructions:	

Section A (attempt all)

1.			
	i. Under Scatter diagram method the observed data are plotted on a graph paper taking one variable on X-axis and other on Y-axis. The scatterdness of the dots so plotted gives the indication whether the correlation is positive or negative and also an idea about the degree of such relationship.		CO3
	ii. Rank correlation is used Where items cannot be measured in quantitative terms, but they can be arrayed or ranked, according to some variable attribute, such as beauty, intelligence and honesty.		CO3
	iii. In all the functional areas of business, like accounting, finance, management, and marketing, knowledge of statistics is a key for decision making.	(1x7)	CO4
	iv. The use of various statistical software like MS Excel, Minitab, SPSS, and SAS has reduced the burden of computing.		CO2
	v. The ordinal scale can be used to rank or order objects.		CO3
	vi. A population is a collection of a few elements, under statistical investigation.		CO1
	vii. A descriptive measure computed from a sample is called a statistic.		CO1

2.	(i) Which of the following descriptive statistics is least affected by adding an outlier to a data set? a. the mean b. the median c. the range d. the standard deviation e. all of the above		**CO1**
	(ii) The difference between the largest and the smallest data values is the a. variance b. interquartile range c. range d. coefficient of variation e. None of the above answers is correct.		**CO1**
	(iii) If a data set has an even number of observations, the median a. can not be determined b. is the average value of the two middle items c. must be equal to the mean d. is the average value of the two middle items when all items are arranged in ascending order e. None of the above answers is correct.		**CO1**
	(iv) In a sample of 800 students in a university, 160, or 20%, are Business majors. Based on the above information, the school's paper reported that "20% of all the students at the university are Business majors." This report is an example of a. a sample b. a population c. statistical inference d. descriptive statistics e. None of the above answers is correct.		**CO2**
	(v) A tabular summary of a set of data showing the fraction of the total number of items in several classes is a a. frequency distribution b. relative frequency distribution c. frequency d. cumulative frequency distribution e. None of the above answers is correct.	**(1x8)**	**CO1**
	(vi) A statistics professor asked students in a class their ages. On the basis of this information, the professor states that the average age of all the students in the university is 21 years. This is an example of a. a census b. descriptive statistics c. an experiment d. statistical inference e. None of the above answers is correct.		**CO2**
	(vii) The variance of a sample of 81 observations equals 64. The standard deviation of the sample equals a. 0 b. 4096 c. 8 d. 6,561 e. None of the above answers is correct.		**CO2**
	(viii) In function $y = f(x)$, 'f' is classified as a. name of function b. value of function		**CO1**

c. upper limit of function
d. lower limit of function
e. None of the above answers is correct.

3.	Decide whether these variables are qualitative or quantitative, and if they are quantitative, whether they are discrete or continuous 1. Number of babies born in a day. 2. Blood group of a person. 3. Time needed to solve a problem. 4. Number of questions in an exam. 5. Temperature of a person.	**(1x5)**	**CO1**
	SECTION B (Attempt any **Eight Questions)**		
4.	The average and variance of 20 items were calculated by a student as 40 and 36 respectively. But at the time of checking it is found that an item which is 25 is wrongly copied as 30.Find the corrected mean and standard deviation.	**(5)**	**CO2**
5.	Functions f and g are defined by $\quad f(x) = 1/x + 3x$ and $\quad g(x) = -1/x + 6x – 4$ Find $(f + g)(x)$ and $(f / g)(x)$. Also find $(f / g)(2)$ and $(f + g)(1)$	**(5)**	**CO1**
6.	The histogram below shows the heights (in cm) distribution of 30 people a) How many people have heights between 159.5 and 169.5 cm?	**(5)**	**CO2**

	b) How many people have heights less than 159.5 cm? c) How many people have heights more than 169.5 cm? d) What percentage of people have heights between 149.5 and 179.5 cm? e) What percentage of people have heights between 159.5 and 179.5 cm?		
7.	At the beginning of the 2015-16 academic year the number of years the full-time teaching faculty had been at Southwestern were: 13, 5, 20, 1, 8, 0, 3, 9, 31, 8, 2, 16, 1, 3, 19, 9, 0, 6, 8, 0, 3, 10, 18, 24, 5, 11, 15, 4, 4, 4, 36, 5, 4, 5, 3, 0, 3, 9, 17, 0, 13, 4, 15, 8, 5, 20, 19, 24, 6, 6, 9, 0, 37 a. What is the mean? b. What is the median? c. Which is a better measure of the center of the data set? Why?	**(5)**	**CO2**
8.	Assume that the chance of a traffic accident in a day in a street of Dehradun is 0.001. If there are 1200 such streets in the whole city, how many days out of a total of 500 days can we expect in the city, (i) No accident (ii) More than 4 accidents per day	**(5)**	**CO4**
9.	A company has two sections with 40 and 65 employees respectively. Their average weekly wages are $450 and $350. The standard deviations are 7 and 9. (i) Which section has a larger wage bill? (ii) Which section has larger variability in wages?	**(5)**	**CO4**
10.	i) The 4th and 8th terms of an A.P. is 24 and the sum of the 6th and 10th terms is 34. Find the 1st term and the common difference of the A.P. (ii) Given the terms $a_{10} = 3/512$ and $a_{15} = 3/16384$ of a geometric sequence, find the exact value of the term a_{30} of the sequence.	**(5)**	**CO2**
11.	What do you mean by descriptive statistics. What are the components of descriptive statistics. How it is different from inferential statistics?	**(5)**	**CO1**
12.	What is the difference between mean deviation and standard deviation. Why we will compute coefficient of variation?	**(5)**	**CO1**
	SECTION C (Attempt any Four Questions)		
13.	A study was made by a retail merchant to determine the relation between weekly advertising expenditure and sales. The following data were recorded: 	Advertising cost	40	20	25	20	30	50	40	20	50	40	25
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Sales	385	400	395	365	475	440	490	420	560	525	480 | (i) Plot a scatter diagram. (ii) Find the regression line to predict weekly sales from advertising expenditures.	**(10)**	**CO4**
14.	Construct a discrete frequency distribution table. Also construct continuous frequency distribution table with suitable class interval size of marks obtained by 50 students of a class are given below: 23, 50, 38, 42, 63, 75, 12, 33, 26, 39, 35, 47, 43, 52, 56, 59, 64, 77, 15, 21, 51, 54, 72, 68, 36, 65, 52, 60, 27, 34, 47, 48, 55, 58, 59, 62, 51, 48, 50, 41, 57, 65, 54, 43, 56, 44, 30, 46, 67, 53	**(10)**	**CO2**
15.	Answer the followings based on output of multiple linear regression.	**(10)**	**CO4**

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9955257
R Square	0.99107143
Adjusted R Square	0.98511905
Standard Error	0.26352314
Observations	6

ANOVA

	df	SS	MS	F	Significance F
Regression	2	23.125	11.5625	166.5	0.000843671
Residual	3	0.208333333	0.069444		
Total	5	23.33333333			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 9
Intercept	36.6666667	3.802107116	9.643775	0.002367	24.56666492	48.766668	24.5666
x	9.875	0.972718127	10.15196	0.002036	6.779376789	12.970623	6.77937
y	-18.125	1.920738429	-9.43647	0.002522	-24.23764692	-12.012353	-24.237

RESIDUAL OUTPUT

Observation	Predicted z	Residuals
1	3.04166667	-0.041666667
2	2.04166667	-0.041666667
3	1.04166667	-0.041666667
4	3.66666667	0.333333333
5	5.29166667	-0.291666667
6	6.91666667	0.083333333

(i) What is the role of ANOVA in regression model.

(ii) Write down the regression model.

(iii)What is the role of p value in regression model.

(iv) How residuals are calculated?

16.	The four variables shown in the data set below are set up to represent a fictitious study of gender, weight and fitness score. The variables include gender, ranking, weight and score. In this example, gender is coded as m or f (recoded as 1 or 2 for computations), weight is the participant's weight, score is a value that the participant scored in a fitness test and rank is their ranking based on that score.	(10)	CO4

Gender	Ranking	Weight	Score
m	1	200	95
m	2	110	92
f	3	103	91
f	4	145	90
f	5	130	88
m	6	180	82
m	7	170	80
f	8	90	75
f	9	102	70
m	10	225	60
m	11	225	59
m	12	108	55
f	13	108	55
m	14	108	55
m	15	167	50

EACH OF THE VARIABLES IS EXAMINED IN THE CHART BELOW:

Statistics

			GENDER	RANKING	SCORE	WEIGH
N	Valid	Statistic	15	15	15	
	Missing	Statistic	0	0	0	
Mean		Statistic	1.40	8.0000	73.1333	144.73
		Std. Error	.13	1.1547	4.1928	12.02
Median		Statistic	1.00	8.0000	75.0000	130.00
Mode		Statistic	1	1.00[a]	55.00	108.
Std. Deviation		Statistic	.51	4.4721	16.2387	46.56
Variance		Statistic	.26	20.0000	263.6952	2168.06
Skewness		Statistic	.455	.000	-.065	.6
		Std. Error	.580	.580	.580	.5
Kurtosis		Statistic	-2.094	-1.200	-1.753	-1.0
		Std. Error	1.121	1.121	1.121	1.1
Range		Statistic	1	14.00	45.00	135.
Minimum		Statistic	1	1.00	50.00	90.
Maximum		Statistic	2	15.00	95.00	225.

a. Multiple modes exist. The smallest value is shown

Answer the following questions:
(i) What type of data does gender represent?
(ii) What type of data does SCORE represent?
(iii) Is this data set skewed in each case? If so, in which direction?
(iv) What does the kurtosis figure tell you in each case?

| 17. | The following information is collected from 200 students of UPES. It is pertaining to the student possessing a bank credit card and or a travel & entertainment credit card. | (10) | CO4 |

Bank credit card	Travel & entertainment credit card	
	Yes	**No**

		Yes	No
Yes		80	40
No		50	30

If a student is selected at random, what is the probability that,

(i) The student has a bank credit card.

(ii) The student has bank credit card & a travel & entertainment credit card.

(iii) The student has a bank credit card or has a travel & entertainment credit card.

(iv) The student has neither a bank credit card nor a travel & entertainment credit card.

(v) The student has a travel & entertainment credit card.