

Deccan Education Society's

Kirti M. Doongursee College of
Arts, Science and Commerce
(AUTONOMOUS)



Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for
Program: Bachelor of Science
Course: F.Y.B.SC.
Subject: Biotechnology

Choice Based Credit System (CBCS)
with effect from
Academic Year 2022-2023

Semester I

Course Code	Course Title	Credits	Lectures /Week
KUSBT22101	Paper I Fundamentals of biotechnology-1	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with various fields of Biotechnology and their applications 			
Learning Outcomes:			
After successful completion of this course, students would be able to <ul style="list-style-type: none"> To impart the knowledge of Food Technology and Fermentation Techniques 			
Unit			
Topics		No of Lectures	
I	Scope and introduction to Biotechnology	15	
II	Applications of Biotechnology	15	
III	Fermentation technology	15	
Textbooks:			
1. A Textbook of Biotechnology by R Chaubey 4 th edition 2. Advanced Biotechnology by R C Dubey 1 st edition 3. Biotechnology, Expanding Horizons by B D Singh, 4 th edition			
Additional References:			
1. Stanbury and Whitaker 3rd ed 2. Screening- Casida 3. Fermenter Design- Nduka Okafor 1 st ed			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22102	Paper II Microbiology-1	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with basic techniques in Staining and Sterilization 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart the knowledge of growth of microorganisms. 			
Unit			
Unit		Topics	No of Lectures
I		Introduction to microbiology	15
II		Sterilization techniques	15
III		Microscopy and stains	15
Textbooks:			
1 Microbiology by Prescott 5th edition			
2 Microbiology by Pelczar, Reid and Chan 5th Edition			
3 Textbook of Microbiology by Ananthanarayan			
Additional References:			
1. Fundamental Principles of Bacteriology A J Salle 7th			
2. Microbiology by Pelczar, Chan and Krieg, 5th Ed			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22103	Paper III Basic Chemistry-1	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with Concepts of Stereochemistry 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart knowledge of Titrimetric and Volumetric Estimations and handling of basic Analytical Techniques like Chromatography and Colorimetry 			
Unit			
Topics			
No of Lectures			
I	Nomenclature and Chemical bonds	15	
II	Titrimetry and gravimetry	15	
III	Stereochemistry	15	
Textbooks:			
<ol style="list-style-type: none"> A Textbook of Organic Chemistry, 15th edition, Arun Bahl, B S Bahl, S. Chand Vogel's Textbook of Quantitative Analysis, Fifth Edition Organic Chemistry, by Solomon and Fryhle 			
Additional References:			
<ol style="list-style-type: none"> 			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22104	Paper IV Biochemistry:Concept of Biomolecules-1	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint the students with basic concepts of Chemistry like Classification and Nomenclature of Chemical compounds To acquaint students with Bioorganic Molecules 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart hands-on skills in preparation of Buffers and Solutions To impart the knowledge of Classification, Structure and Characterization of Biomolecules 			
Unit			
	Topics	No of Lectures	
I	Water, Standard solutions and Buffers	15	
II	Basics of Carbohydrate Chemistry	15	
III	Basics of Lipid Chemistry	15	
Textbooks:			
<ol style="list-style-type: none"> Robert Murray, Daryl G., Peter M., Victor R.; Harper's Illustrated Biochemistry. Satyanarayana U. and Chakrapani U. (2007). Biochemistry. 3rd Edition. Books and Allied (P) Ltd. Leininger PRINCIPLES OF BIOCHEMISTRY by Nelson and Cox Fifth Edition 			
Additional References:			
<ol style="list-style-type: none"> 			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22105	Paper V Genetics	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with concepts in Genetics 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart skills in Techniques in Genetic Analysis and Population Genetics 			
Unit			
Unit	Topics	No of Lectures	
I	Genetics fundamentals	15	
II	Microbial genetics	15	
III	Population genetics	15	
Textbooks:			
<ol style="list-style-type: none"> iGenetics – A molecular approach Peter J Russell 3rd edition. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology (2005) – P.S. Verma and Agarwal-S. Chand dinon Publications 			
Additional References:			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22106	Paper VI Molecular biology-1	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with DNA Replication, Repair and Genetic Engineering 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> Impart the knowledge of molecular Biology Techniques 			
Unit			
Unit		Topics	
No of Lectures			
I	DNAComposition, Chromosomee, DNA structureandpacking	15	
II	DNA replication	15	
III	Mutation and repair	15	
Textbooks:			
<ol style="list-style-type: none"> igenetics – A molecular approach Peter J Russell 3rd edition Biochemistry - U Satyanarayana U.Chakrapani, (2013) 4th edition Principles of Genetics. E J Gardner, M J Simmons & D Peter Snustad. 8th edition 			
Additional References:			
<ol style="list-style-type: none"> Cell and Molecular Biology 5th edition by Gerald Karp (John Wiley and sons publications) Genetics, (2006) Strickberger MW - (Prentice Hall, India) (recombination repair) 			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22107	Paper VII Ability Enhancement Course Communication skills	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint the students with concepts of Societal Awareness 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart knowledge of Society and make students aware about the Problems in Society 			
Unit			
	Topics	No of Lectures	
I	Academic skills	15	
II	Soft skills	15	
III	Professional skills	15	
Textbooks:			
<ol style="list-style-type: none"> Communications Skill-Sanjay Kumar and Pushp Lata Oxford University. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeeta Sharma 			
Additional References:			

Semester II

Course Code	Course Title	Credits	Lectures /Week
KUSBT22201	Paper I Fundamentals of Biotechnology-2	2	3
About the Course:			
Course Objectives: <ul style="list-style-type: none"> • The learner would be able to learn Food technology and Food quality enhancement. • The learners acquires the knowledge of Introduction to Medical Biotechnology • The learner will gain the knowledge Vaccines 			
Learning Outcomes: After successful completion of this course, students would be able to <ul style="list-style-type: none"> • The learner will be able to impart skills about Food and Medical Biotechnology 			
Unit			
	Topics		No of Lectures
I	FoodBiotechnology		1
II	Medical biotechnology		1
III	Genetic engineering		1
Textbooks: <ol style="list-style-type: none"> 1.Food Microbiology, 5th edition, William C. Frazier, Dennis C. Westhoff, N.M. Vanitha, McGraw Hill Education, India 2.Fundamentals of Food Biotechnology, 2nd edition, Byong H. Lee, Wiley Blackwell 3.Prescott's Microbiology, 9th edition, Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton, McGraw-Hill, USA 			
Additional References: <ol style="list-style-type: none"> 1.Industrial Microbiology, A. H. Patel 2.Biotechnology Fundamentals by Dr. Firdos Alam Khan 3.Medical Biotechnology Glick 1st edition 			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22202	Paper II Cell biology and Microbiology-2	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with concept of Biodiversity and Cell Biology 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart skill in handling and culture of Microorganisms 			
Unit			
Unit	Topics	No of Lectures	
I	Ultrastructure of Prokaryotic and eukaryotic cells	15	
II	Microbiology	15	
III	Virology	15	
Textbooks:			
<ol style="list-style-type: none"> 1. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by Verma and Agarwal 2. Cell and Molecular Biology by Karp, 6th Ed 3. The Cell by Cooper and Hausman, 4th Ed 			
Additional References:			
<ol style="list-style-type: none"> 1. Microbiology Stanier 5th ed 2. Pelczar Ried and Chan 			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22203	Paper III Basic Chemistry-2	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with concepts in Thermodynamics, Kinetics and Redox Reactions 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart skills in Kinetics and Chemical Reactions 			
Unit			
	Topics		No of Lectures
I	Thermodynamics		15
II	Chemical Kinetics		15
III	Oxidation Reduction reactions		15
Textbooks:			
1. Satyanarayana U. and Chakrapani			
2. Textbook of Physical Chemistry- F.Y.B.Sc. - Chapter 1.2 (Unit 1) 2015 Edn			
1. Prof. Mathur MMS Chemical Calculations			
Additional References:			
1.			
2.			
3.			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22204	Paper IV Biochemistry: Concept of Biomolecules-2 and analytical techniques	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with Bioorganic Molecules, and concepts in Enzymology, 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart the knowledge of Classification, Structure and Characterization of Biomolecules 			
Unit			
Unit	Topics	No of Lectures	
I	Proteins and amino acids	15	
II	Enzymes	15	
III	Basics of Analytical techniques	15	
Textbooks:			
1. Nelson D. L., and Cox M. M. (2008). Leininger Principles of Biochemistry. 4 th Edition. W H Freeman and Company			
2. Principles and Techniques of Biochemistry and Molecular Biology, 7 th edition, Keith Wilson & John Walker, Cambridge University Press.			
3.			
Additional References:			
1.			
2.			
3.			

Course Code	Course Title	Credits	Lectures /Week
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KUSBT22205	Paper V Physiology and immunology	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with Physiological Processes in Plants and Animals and to acquaint students with the concept of immunology 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart the knowledge of Physiology and Immunological Techniques 			
Unit	Topics	No of Lectures	
I	Plant Physiology	15	
II	Animal Physiology	15	
III	Immunology	15	
Textbooks:			
1. Leininger Principles of Biochemistry, 5th Edition- Nelson D. L., and Cox M. M. (2008) W H Freeman and Company			
2. A textbook of plant physiology and biochemistry by S K. Verma (S Chand publications) part1- physiology- (photosynthesis)			
3. Plant Physiology: Theory and Applications, 2e- S. L. Kochhar and Sukhbir Kaur Gujral , Cambridge University			
Additional References:			
1.			
2.			
3.			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22206	Paper VI Basic Computers and Biostatistics	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint students with concepts in computers, computer networking and Biostatistics. 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart the skills in Computer, Networking and Biostatics. 			
Unit			
	Topics	No of Lectures	
I	Introduction to computers	15	
II	Computer networking	15	
III	Biostatistics	15	
Textbooks:			
1. Goel, A. (2010). Computer Fundamentals. India: Pearson Education			
2. Computer Literacy BASICS: A Comprehensive Guide to IC3			
3.			
Additional References:			
1.			
2.			

Course Code	Course Title	Credits	Lectures /Week
KUSBT22207	Paper VII Ability Enhancement Course- Sustainable development and Environmental biotechnology	2	3
About the Course:			
Course Objectives:			
<ul style="list-style-type: none"> To acquaint the students with concepts of Globalization, Ecology and Environment 			
Learning Outcomes:			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> To impart knowledge of Globalization, make students aware about the Problems in Society 			
Unit			
Topics			
No of Lectures			
I	Ecology & interactions	15	
II	Pollution and climate change	15	
III	Renewable sources of energy	15	
Textbooks:			
<ol style="list-style-type: none"> 1. EnvironmentalBiotechnology- AlanScragg 2ndedition 2. Environmental Biotechnology – M.H.Fulekar 3.Textbookof Environmental studies. For Undergraduate courses of all Branches. UGC, New Delhi. 			
Additional References:			
<ol style="list-style-type: none"> 1. 2. 3. 			

Semester I Practicals

Key	
Red	Major
Blue	Minor
Green	Assignments/ Case study etc

Course Code	Course Title	Credits	Lectures/ Week
	Practical I Practicals of USBT101 and USBT102	2	3
1	Assignment on any one branch of Biotechnology.		
2	Analyse a case-study and write a report on any one recent application of Biotechnology (Not older than past 5 years)		
3	Field visit/ Virtual visit (website) of National/ International research institutes for research in biotechnology and have a group discussion during the lab session.		
4	Study of Microscope – Compound Microscope (Including Handling and storage), Dark Field Microscope, Phase Contrast Microscope, Fluorescent Microscope, TEM, SEM. (Including gray diagrams)		
5	Observation of microorganisms using bright field microscope - Protozoa, Molds and Yeasts, Algae – from natural habitat/permanent slides.		
6	Monochrome staining using any suitable material. (Bacteria/Plant/Animal tissue)		
7	Differential staining – Gram staining, Acid fast staining, Romanowsky staining.		
8	Special staining – cell wall, capsule, spores, negative staining.		
9	Fungal staining – wet mount (Lactophenol cotton blue/Methylene Blue)		
10	Preparation of media - Nutrient broth and Agar, MacConkey Agar, Sabouraud's Agar		
11	Sterilization of Laboratory Glassware and Media using Autoclave and Hot air oven		
12	Isolation techniques: T-streak, polygon method		
13	Colony Characteristics of Microorganisms.		
14	Use of Bergey's manual to help identify any one isolate		
15	Isolation of Yeasts from the natural environment.		
16	Study of morphology and colony characteristics of yeasts		
17	Fermentation of Sugarcane juice using yeast.		

18	Qualitative Estimation of Alcohol by Ritter Test.
19	Screening of antibiotic producers from soil by Crowded plate method. (Demonstration)
20	Screening of antibiotic producers from soil by Wilkins Overlay method. (Demonstration)

Course Code	Course Title	Credits	Lectures/ Week
	Practical 2 Practicals of USBT103 and USBT104	2	3
1	Safety in Chemistry Laboratory: Dress code, Dos and Don't, First Aid		
2	Preparation of Normal, Molar, Molal, Percent solution		
3	Preparation of solution - PPM and PPB		
4	Demonstration of pH meter and digital Balance		
5	Preparation of Acetate buffer pH 4.6, Carbonate buffer pH 6.8, Tris buffer pH 8.3		
6	Structures of Aldo series and Keto series of Monosaccharides, disaccharides and Polysaccharides		
7	Qualitative tests for carbohydrates; Molisch test, Benedict's test, Iodine test, Osazone formation		
8	Estimation of carbohydrates by Lane-Eynon method		
9	Qualitative tests for lipids		
10	Salowski's Test for Cholesterol		
11	Saponification of fats		
12	Determination of Acetic acid in Vinegar by Titrimetric Method.		
13	Determination of the amount of Fe(II) present in the given solution Titrimetrically		
14	Determination of amount of $\text{NaHCO}_3 + \text{Na}_2\text{CO}_3$ in the given solid mixture Titrimetrically		
15	Determination of the amount of Mg(II) present in the given solution complexometrically		
16	Determination of percent composition of BaSO_4 and NH_4Cl in the given mixture gravimetrically		
17	Practice problems on nomenclature of organic compounds (Identify organic compounds based on formulae or draw formulae from names).		
18	Construct a detailed flowchart for classification of organic compounds.		
19	Characterization of Organic Compounds (any three organic compounds)		

20	Assignment-Practice problems on stereochemistry (Identifying stereoisomers, conformations of specific compounds, chirality and symmetry elements; drawing stereoisomers; locating and naming stereogenic centers).
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Course Code	Course Title	Credits	Lectures/ Week
	Practica 3 USBT103 Practicals of USBT105 and USBT106	2	3
1	Study of mitosis from suitable plant material		
2	Study of meiosis from suitable plant material/Permanent slides/Photographs		
3	Study of mitosis using pre-treated root tips of <i>Allium cepa</i> to study the effect of mutagens-chemical (colchicine/ PDB) on mitosis		
4	Study the effect of UV radiation as a mutagenic agent		
5	Extraction of DNA from plant material		
6	Qualitative analysis of DNA		
7	Identification of types of point mutations from given DNA sequences		
8	Isolation of antibiotic/dye resistant mutants using replica plate technique.		
9	Demonstration of Ames test for mutagenicity.		
10	Study of Karyotype - Normal male and Normal female		
11	Bar body identification in cells of Buccal smear		
12	Problems based on Mendelian Genetics, its modifications and gene interactions.		
13	Construction of pedigree charts and analysis of human genetic traits using Pedigree analysis.		
14	Preparation of competent cells and demonstration of Bacterial transformation and mapping		
15	Demonstration of Bacterial Conjugation and interrupted mating-based mapping		
16	Demonstration of transduction and mapping		
17	Study of Watson and Crick model of DNA using micrographs/Schematic representations.		
18	Study of Semiconservative replication of DNA through micrographs/ Schematic representation.		

19	Conduct a survey on observable genetic traits and compare those inventories with other students in groups. (Blood group, tongue rolling, earlobe attachment, PTC tasting etc.)
20	Study of blood groups ABO in humans

Semester II Practicals

Course Code	Course Title	Credits	Lectures/ Week
	Practical 1 USBTP201 Practicals of USBT201 and USBT202	2	3
1	Assignment-Write a report on a case study on any one food product developed at CFTRI.		
2	Write a SOP on any one food safety procedure in compliance with Good Manufacturing Practices/Flow sheet of Unit operations for any two food products.		
3	Microbial examination of food and detection of Pathogenic Bacteria from Food Samples		
4	Microscopic determination of Microbial flora from Yoghurt and Lactic Acid Determination		
5	Isolation and characterization of organisms causing Food Spoilage (Using Bergey's Manual)		
6	Isolation and characterization of food fermenting organism from idli batter (Using Bergey's Manual)		
7	Sauerkraut production and to analyze quality parameters during production (odour, color, pH, total acidity)		
8	Determination of food preservative concentration (salt & sugar) using MIC.		
9	Processing fruits for preparation and packaging of jams or jellies.		
10	Detection of Food adulterants in food samples		
11	Isolation of chromosomal DNA from <i>E. coli</i> and Agarose gel electrophoresis of the chromosomal DNA		
12	Study of the structure of important a. animal viruses (rhabdo, influenza, paramyxo, hepatitis and retroviruses) using electron micrographs/diagrams. b. plant viruses (caulimo, gemini, tobacco ringspot, cucumber mosaic and alpha-alpha mosaic)		

	iruses) using electron micrographs/diagrams. (ϕ X174,T4,3) using electron micrographs/diagrams
13	Isolation and enumeration of bacteriophages (PFU) from water/sewage samples using double agar layer technique
14	Motility by hanging drop method/stab culture
15	Methods of preservation of culture
16	Study of Growth Curve of <i>E. coli</i>
17	Preparation of vaccine (Demonstration) and Sterility testing of Vaccine
18	Enumeration by Breed's count
19	Isolation and Enumeration of microorganisms-Serial dilution, Surface spread method,
20	Isolation and Enumeration of microorganisms-Serial dilution, Pour plate method.

Course Code	Course Title	Credits	Lectures/Week
	Practical 2 USBTP202 Practicals of USBT203 and USBT204	2	3
1	To determine enthalpy of dissolution of salt like KNO_3		
2	Determine the rate constant for hydrolysis of ester using HCl as a catalyst		
3	Study the kinetics of reaction between Thiosulphate ion and HCl		
4	Study reaction between potassium Persulphate and Potassium Iodide kinetically and hence to determine order of reaction		
5	Study the reaction between $NaHSO_3$ and $KMnO_4$ and balancing the reaction in acidic, alkaline and neutral medium		
6	Study transfer of electrons (Titration of sodium thiosulphate with potassium dichromate)		
7	Determination of the volume strength of hydrogen peroxide solution by titration with standardised potassium permanganate solution		
8	Determination of amount of Oxalate and oxalic acid in the given solution Titrimetrically		

9	Tutorial: Structure of Amino acids
10	Titration curve of amino acid
11	Qualitative analysis of amino acids and proteins
12	Separation by Paper Chromatography a. Amino acids b. Sugars
13	Separation by Thin layer chromatography c. Plants Pigments d. Fatty acids
14	Qualitative Assay of enzyme urease, amylase, dehydrogenase, catalase and protease from Plant/Animal/Microbial source.
15	Enzyme Kinetics: Study of the effect of pH, Temperature on activity of Amylase
16	Study of Effect of Substrate Concentration on amylase enzyme activity and determination of V_{max} and K_m
17	Study of Effect of inhibitors on amylase enzyme activity
18	Determination of absorption maxima of $CuSO_4$ / $K_2Cr_2O_7$
19	Verification of Beer and Lambert's Law
20	Estimation of Protein by Biuret method

Course Code	Course Title	Credits	Lectures/Week
	Practical 3 - Practicals of USBT205 and USBT206	2	3
1	Study of Hill's reaction		
2	To measure the rate of photosynthesis by Winkler's method		
3	Effect of PGRs on seed germination		
4	Solvent extraction of plant pigments and study the absorption spectra of pigments		
5	Qualitative detection of plant secondary metabolites using standard tests-e.g. Tests for tannins, flavonoids, alkaloids, terpenoids, saponins, steroids.		
6	Separation of Carotenoids by thin layer chromatography		
7	Quantitative estimation of sugars by DNSA method		
8	Effect of different concentrations of sodium chloride on RBC and determination of the concentration isotonic to blood.		
9	Study of human blood count (RBC and WBC) using Haemocytometer		
10	Estimation of Haemoglobin in human blood.		
11	Analysis of Urine.		
12	Demonstration of Phagocytosis		
14	Study of bacterial flora of skin (as a physical barrier in innate immunity) by swab method/Hand imprint method.		
15	<p>Word Processing:</p> <ul style="list-style-type: none"> a. Creating, Saving & Operating a document, Editing, Inserting, Deleting, Formatting, Moving & Copying Text. b. Find & Replace, Spell Checker & Grammar Checker, c. Document Enhancement (Borders, Shading, Header, Footer), d. Printing document (Page layout, Margins), <p>Working with Graphics (Word Art), Working with Tables & Charts, Inserting Files (Pictures, Databases, Spreadsheets)</p>		
16	<p>Spreadsheet Applications:</p> <ul style="list-style-type: none"> a. Worksheet Basics: Entering information in a Worksheet, Saving & Opening a Worksheet, Editing, Copying & Moving data, Inserting, Deleting & Moving Columns & Rows, Clearing a. Using formulas in spreadsheet for simple calculations b. Creating graphs, pie chart etc 		
17	<p>Creation of Computer Presentations with graphics:</p> <ul style="list-style-type: none"> a. Creation of slides, changing layout and using the design tab. b. Using the insert tab function for pictures, audio, video, shapes, smart art, word art, textbox. c. Assigning Transitions and animations to slides. 		
18	Searching/Surfing on the internet		
19	Measures of central tendency: Mean, median and mode for grouped and ungrouped data (Manual and Excel)		
20	Measures of dispersion: Standard deviation for grouped and ungrouped data: standard value for the mean and proportion (Manual and Excel)		

Evaluation Scheme for First Year (UG) under AUTONOMY

I. Internal Evaluation for Theory Courses – 40 Marks

- (i) Continuous Internal Assessment 1 - Assignment-Tutorial – 20 Marks
- (ii) Continuous Internal Assessment 2 – 20 Marks (Class Test with Fill in the Blanks, True or False & Answer the following)

II. External Examination for Theory Courses – 60 Marks

- Duration: 2 Hours
- Theory question paper pattern:

All questions are compulsory.

Question	Based on	Options	Marks
Q.1	Unit I, II, III,	<i>Any 12 out of 15</i>	12
Q.2	Unit I	<i>Any 2 out of 4</i>	12
Q.3	Unit II	<i>Any 2 out of 4</i>	12
Q.4	Unit III	<i>Any 2 out of 4</i>	12
Q.5	Unit I, II, III,	<i>Any 3 out of 6</i>	12

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 50 Marks (30 marks External + 20 marks Internal)

Sr. No.	Undergraduate Practical Internal Evaluation:	Marks
1	Short Experiment/Field Trip/Excursion/Industrial Visit Report	15
2	Journal	5

Sr. No.	Undergraduate Practical External Evaluation:	Marks
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1	Experiment/s	25
2	Viva	5

- Duration: 2 Hours for each practical course
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam