

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.**



CIRCULAR NO.SU/ Sci./College/NEP-2020/104/2024

It is hereby inform to all concerned that, In continuation circular No.SU./Revised B.Sc./NEP/72/2024/25588-96 dated 29.04.2024, the revised syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technolgy, the Academic Council at its meeting held on 08 April 2024 has accepted **the following Revised B.Sc. Course Structure & Curriculum** as per direction by the State Government dated on 13 March 2024 under the Faculty of Science & Technology (as per National Education Policy – 2020) run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1	Physics	Ist and IInd semester
2	Instrumentation Practice	Ist and IInd semester
3	Electronics	Ist and IInd semester
4	Mathematics	Ist and IInd semester
5	Industrial Chemistry	Ist and IInd semester
6	Agrochemical Fertilizer	Ist and IInd semester
7	Horticulture	Ist and IInd semester
8	Biochemistry	Ist and IInd semester
9	Botany	Ist and IInd semester
10	Zoology	Ist and IInd semester
11	Biotechnology	Ist and IInd semester
12	bioinformatics	Ist and IInd semester
13	Microbiology	Ist and IInd semester
14	Dairy Science & TEchnology	Ist and IInd semester
15	Statistics	Ist and IInd semester
16	computer Science	Ist and IInd semester
17	Geology	Ist and IInd semester
18	Chemistry	Ist and IInd semester
19	Analytical Chemistry	Ist and IInd semester
20.	Polymer Chemistry	Ist and IInd semester
21.	Environmental Science	Ist and IInd semester
22.	Fishery Science	Ist and IInd semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajanagar
-431 004.
REF.No. SU/SCI./2024/27128-35
Date:-27.05.2024.

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Deputy Registrar,
Academic Section.

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajanagar.
- 2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajanagar.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajanagar.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajanagar.
- 6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar.
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Dr. Babasaheb Ambedkar Marathwada University
Chhatrapati Sambhajnagar- 431001



B.Sc. Degree Programme

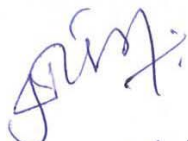
(Three Year / Four Years (Hons) / Four Years (Hons with Research))

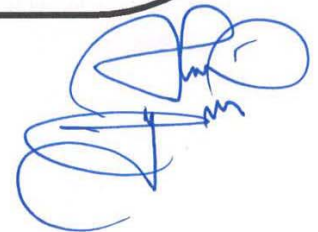
Course Structure and Syllabus for B. Sc. First Year

(AS PER NEP-2020)

Subject (Major): MATHEMATICS

Effective from 2024-25


Dr. J. A. Nanawase



PREFACE

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Science (B. Sc.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Science (B. Sc.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore, the curriculum is designed to promote experiential learning, research, and hands-on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Science (B. Sc.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment. By integrating courses on ethics, sustainability, and social sciences, the Bachelor of Science (B. Sc.) program aims to produce graduates who are not only proficient in their respective fields but also compassionate, ethical leaders committed to making a positive impact on the world.

As we embark on this journey of educational transformation guided by the National Education Policy 2020, the Bachelor of Science (B. Sc.) curriculum stands as a testament to our collective vision of a more equitable, inclusive, and enlightened society. It is our hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potential and contribute meaningfully to the advancement of knowledge and the betterment of humanity.

Introduction to Undergraduate Degree course in Mathematics:

As per the recommendations of the NEP-2020, the undergraduate degree course in mathematics is a six/ eight semester course spread over three/ four academic years. The teaching – learning process is student-centric and it involves both theory and practical components. It offers a flexibility of programme structure while ensuring that the student gets a strong foundation in the subject and gains in-depth knowledge. Besides the Discipline Specific Core (DSC) courses, a student can opt courses from the syllabus comprising of Discipline Specific Electives (DSEs), Generic Electives (GEs), Skill Enhancement Courses (SECs), Ability Enhancement courses (AECs) and Value Addition Courses (VACs). Thereby, bringing out the multidisciplinary approach and adherence to innovative ways within the curriculum framework. Moreover, it allows a student maximum flexibility in pursuing his/her studies at the undergraduate level to the extent of having the liberty to eventually design the degree with multiple exit options depending upon the needs and aspirations of the student in terms of his/her goals of life, without compromising on the teaching learning, both in qualitative and quantitative terms. This will suit the present day needs of students in terms of securing their paths towards higher studies or employment.

Courses of Study: Courses of the study indicate pursuance of study in a particular discipline. Every discipline shall offer four categories of courses of study, viz. Discipline Specific Core (DSC) courses, Discipline Specific Electives (DSEs), Skill Enhancement Courses (SECs) and Generic Electives (GEs). Besides these four courses, a student will select Ability Enhancement Courses (AECs) and Value-Added Courses (VACs) from the respective pool of courses offered by the University.

- a) **Discipline Specific Core (DSC):** Discipline Specific Core is a course of study, which should be pursued by a student as a mandatory requirement of his/ her programme of study. In Bachelor of Science (Hons.) Mathematics programme, DSCs are the core credit courses of Mathematics which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options as per NEP 2020.
- b) **Discipline Specific Elective (DSE):** The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics from which a student will choose to study based on his/ her interest.
- c) **Generic Elective (GE):** Generic Electives is a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline) which is meant to provide multidisciplinary or interdisciplinary education to students. In case a student opts for DSEs beyond his/ her discipline specific course(s) of study, such DSEs shall be treated as GEs for that student.
- d) **Ability Enhancement course (AEC), Skill Enhancement Course (SEC) and Value Addition Course (VAC):** These three courses are a pool of courses offered by all the Departments in groups of odd and even semesters from which a student can choose.

- i. **AEC:** AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are based on Language and Literature, and Environmental Science which are mandatory for all disciplines.
- ii. **SEC:** SECs are skill-based courses in all disciplines and are aimed at providing hands-on training, competencies, proficiency and skills to students. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction.
- iii. **VAC:** VACs are common pool of courses offered by different disciplines and aimed towards personality building, embedding ethical, cultural and constitutional values; promote critical thinking, Indian knowledge systems, scientific temperament, communication skills, creative writing, presentation skills, sports and physical education and team work which will help in all round development of students.

Structure of B. Sc. (Three / Four Years Honours / Honours with Research Degree) Programme with Multiple Entry and Exit Options

Subject (Major): Mathematics

BSc First Year: 1st Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory (Mathematics)	DSC-1	Calculus	2		2		2+2 = 4
	DSC-2	Lab Course-I Practical based on DSC-1		4		2	
Major (Core) M2 Mandatory	DSC-1	-----	2		2		2+2 = 4
	DSC-2	Practical based on DSC-1		4		2	
Major (Core) M3 Mandatory	DSC-1	-----	2		2		2+2 = 4
	DSC-2	Practical based on DSC-1		4		2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	GE/OE-1	To be chosen from other faculty	2		2		2
SEC (Skill Enhancement Courses) (Choose any one from pool of courses)	SEC-1	1) Combinatorial Mathematics 2) Theory of Equations	1		1		2
	SEC-2	1) Lab Course-SECA 2) Lab Course-SECB		2		1	
AEC, VEC, IKS	AEC-1	English (Common for all the faculty)	2		2		2+2 =4
	IKS-1	Choose any one from pool of courses	2		2		
OJT/ FP/CEP/CC/RP	CC-1	Health and Wellness (Common for all the faculty)		4		2	2
			13	18	13	09	22

GE/OE-1 : **Business Mathematics-I** (This course will be available for the students from other faculty)

BSc First Year: 2nd Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory (Mathematics)	DSC-3	Differential Equations	2		2		2+2 = 4
	DSC-4	Lab Course -II Practical based on DSC-3		4		2	
Major (Core) M2 Mandatory	DSC-3		2		2		2+2 = 4
	DSC-4	Practical based on DSC-3		4		2	
Major (Core) M3 Mandatory	DSC-3		2		2		2+2 = 4
	DSC-4	Practical based on DSC-3		4		2	
Generic / Open Elective (GE/OE) (Choose any two from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	GE/OE-2	To be chosen from other faculty	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	VSC-1	1) Financial Accounting 2) Basic Statistics	1		1		2
	VSC-2	1) Lab Course-VSCA 2) Lab Course-VSCB		2		1	
AEC, VEC, IKS	AEC-1	English (Common for all the faculty)	2		2		2+2 =4
	VEC-1	Constitution of India (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	CC-2	Yoga Education / Sports and Fitness (Common for all the faculty)		4		2	2
			13	18	13	09	22
Exit Option : Award of UG Certificate in 3 Majors with 44 credits and an additional 4 credits of core NSQF course / Internship OR continue with Major and Minor							

GE/OE-2 : **Matrices** (This course will be available for the students from other faculty)

Students will have to choose any three subjects as a **Major 1, Major 2, Major 3**, from Basket 1 under the Faculty of Science and Technology.

Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year. Students will have to select / declare choice of one subject as a **major subject** in the beginning of second year **out of three major options M1, M2 and M3 (which were opted in the first year).**

Detailed Illustration of Courses included in 1st and 2nd semester:

- 1) **Major (Core)** subject are mandatory.

DSC-1 : This is a 2 credit theory course corresponding to Major (core) subject

DSC-2 : This is a 2 credit practical course based on DSC-1

DSC-3 : This is a 2 credit theory course corresponding to Major (core) subject

DSC-4 : This is a 2 credit practical course based on DSC-3

- 2) **Generic / Open Elective (GE/OE):** (Needs to be chosen (any two) from pool of courses available at respective college). **These courses should be chosen compulsorily from faculty other than that of Major.**

GE/OE -1 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

GE/OE -2 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

- 3) **SEC (Skill Enhancement Courses)** : Choose any one from pool of courses. These courses needs to be designed to enhance the technical skills of the students in specific area.

SEC-1 : This is a 1 credit theory course to enhance the technical skills of the students in specific area.

SEC-2 : This is a 1 credit practical course based on SEC-1.

- 4) **VSC (Vocational Skill Courses)** : Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

VSC-1 : This is a 1 credit theory course based Hands on Training corresponding to Major (core) subject.

VSC-2 : This is a 1 credit practical course based on VSC-1

- 5) **AEC (Ability Enhancement courses):** The focus of these courses should be based on linguistic and communication skills.

AEC-1 : English

This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

AEC-2 : English

This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

- 6) **IKS** (Indian Knowledge System) : The courses related to traditional and ancient culture of India will be included in this section. The respective college will have to choose one of the courses from the pool of courses designed by the University.

IKS-1 : To be chosen from the pool of courses designed by the University

This is a 2 credit theory course based on Indian Knowledge System. It will be common for all the faculty

- 7) **VEC** (Value Education Courses): The courses such as understanding India, Environmental Science / Education, Digital and Technological solutions etc will be part of Value Education Courses.

VEC-1 : Constitution of India

This is a 2 credit theory course based on value education. It will be common for all the faculty

- 8) **CC** (Curricular Courses): The courses such as Health and wellness, Yoga education, Sports and Fitness, Cultural activities, NSS/NCC, Performing Arts.

CC-1 : Health and Wellness

This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

CC-2 : Yoga education / Sports and Fitness

This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

General Guidelines for Course Selection

- 1) The Major subject is the discipline or course of main focus, bachelors degree shall be awarded in that discipline / subject.
- 2) Students will have to choose any three subjects as a Major 1, Major 2, Major 3, from **Basket 1** under the Faculty of Science and Technology (based on the available options in the respective college).
- 3) Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year.
- 4) In the beginning of second year, students will have to select / declare choice of **one major subject and one minor subject** from three major options **M1, M2 and M3 (which were opted in the first year)**
- 5) Once the students finalize their **Major Subject and Minor Subject** in the beginning of the second year of the programme, they shall pursue their further education in that particular subject as their **Major and Minor** subjects. Therefore, from second year onwards curriculum of the Major and Minor subjects shall be different.
- 6) Students are required to select **Minor subject from other discipline of the same faculty**
- 7) Students are required to select **Generic /Open Elective** (vertical 3 in the credit framework) **compulsorily from the faculty different than that of their Major / Minor subjects.**
- 8) Vocational Skill Courses and Skill Enhancement Courses (VSC and SEC) shall be related to the Major subject
- 9) Curriculum of Ability Enhancement Courses (AEC), Value Education Courses (VEC), Indian Knowledge System (IKS), and Co-curricular Courses (CC) will be provided by the University separately.

Programme Educational Objectives (PEOs) :

Programme Educational Objectives (PEOs) for the Bachelor of Science Curriculum under the National Education Policy 2020:

1. **Mastery of Discipline-Specific Knowledge:** Graduates of the Bachelor of Science program will demonstrate a deep understanding of fundamental principles, theories, and methodologies in their chosen scientific discipline, enabling them to analyze complex problems, propose innovative solutions, and contribute to advancements in their field.
2. **Interdisciplinary Proficiency:** Graduates will possess the ability to integrate knowledge and skills from multiple scientific disciplines, fostering a holistic approach to problem-solving and innovation. They will be equipped to address multifaceted challenges by drawing upon diverse perspectives and methodologies.
3. **Critical Thinking and Analytical Skills:** Graduates will develop strong critical thinking abilities, enabling them to evaluate information rigorously, analyze data effectively, and make informed decisions based on evidence. They will demonstrate proficiency in applying logical reasoning and scientific methods to solve problems and generate new knowledge.
4. **Leadership and Innovation:** Graduates will demonstrate leadership qualities and entrepreneurial mindset, capable of initiating and driving positive change in their organizations and communities. They will exhibit creativity, resilience, and adaptability, harnessing innovation to address complex challenges and seize opportunities for growth and advancement.
5. **Global Citizenship and Cultural Sensitivity:** Graduates will possess a global perspective and cultural sensitivity, recognizing the inter connectedness of diverse communities and the importance of collaboration across borders. They will engage in cross-cultural dialogue, embrace diversity, and contribute to the advancement of knowledge and understanding on a global scale.

These Programme Educational Objectives serve as guiding principles for the Bachelor of Science curriculum, reflecting our commitment to nurturing well-rounded graduates who are prepared to excel in their careers, contribute to society, and lead meaningful lives in a rapidly changing world.

Programme Outcomes (POs) :

The National Education Policy (NEP) 2020 for India emphasizes several key aspects for Bachelor of Science (B.Sc.) programs, aiming to produce graduates who are not only well-versed in their respective disciplines but also equipped with skills necessary for holistic development and employability. While specific program outcomes may vary between institutions and disciplines within B.Sc. programs, here are some common outcomes aligned with NEP 2020:

- **PO1. The citizenship and society:** Apply broad understanding of ethical and professional skill in science subjects in the context of global, economic, environmental and societal realities while encompassing relevant contemporary issues.
- **PO2. Environment and sustainability:** Apply broad understanding of impact of science subjects in a global, economic, environmental and societal context and demonstrate the knowledge of, and need for sustainable development.
- **PO3. Ethics:** Apply ability to develop sustainable practical solutions for science subject related problems within positive professional and ethical boundaries.
- **PO4. Individual and team work:** Function effectively as a leader and as well as team member in diverse/ multidisciplinary environments.
- **PO5. Communication:** Communicate effectively on complex science subject related activities with the scientific community in particular and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO6. Project management and finance:** Demonstrate knowledge and understanding of the first principles of science and apply these to one's own work as a member and leader in a team, to complete project in any environment.
- **PO7. Life-long learning:** Recognize the need for lifelong learning and have the ability to engage in independent and life-long learning in the broadest context of technological change.

These program outcomes align with the broader goals of NEP 2020 to transform higher education in India and prepare students for the challenges and opportunities of the 21st century. Board of Studies designing B.Sc. curricula are encouraged to incorporate these outcomes into their program objectives and learning outcomes.

Programme Specific Outcomes (PSOs):

On completion of the 03/ 04 years Degree in B.Sc. (Mathematics) **students will be able to:**

- **PSO 1.Disciplinary Knowledge:** Bachelor degree in Mathematics is the culmination of in-depth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of pure and applied mathematics. This also leads to study the related areas..
- **PSO 2.Critical thinking and analytical reasoning:** The students undergoing this programme acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing and various aspects of real life problems.
- **PSO 3.Problem Solving:** The Mathematical knowledge gained by the students through this programme develops an ability to analyse the problems, identify and define appropriate computing requirements for its solutions. This programme enhances students overall developments.
- **PSO 4. Research related skills:** The completing this programme develops the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics. Ability to pursue advanced studies and research in pure and applied Mathematical sciences
- **PSO 5.Information/digital Literacy:** The completion of this programme will enable the learner to use appropriate software's to solve system of algebraic equations and differential equations.
- **PSO 6. Self-directed learning:** The students completing this programme will develop ability of working independently and to make an in-depth study of various notions of Mathematics.

Semester – I

DSC-1 : Calculus

Total Credits : 02

Total Contact Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

- i) To learn the derivatives of the functions of one variable.
- ii) To learn the partial derivatives of the functions.
- iii) To learn applications of definite integral for quadrature, rectification and volume of solid of revolution.

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Find derivative of hyperbolic, inverse hyperbolic functions and n th derivatives of given functions.
- ii) Find the Maclaurin's series expansion of functions.
- iii) Find the partial derivatives of functions.
- iv) Determine areas of plane regions, length of curves and volume of solid of revolution.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Differentiation: Hyperbolic functions, derivatives of hyperbolic functions, derivatives of inverse hyperbolic functions, Successive Differentiation: Higher order derivatives, Calculation of n th derivatives: Some standard results, Determination of n th derivative of rational functions, The n th derivatives of the products of the powers of sines and cosines, Leibnitz's theorem: The n th derivative of the product of two functions.	10 Hrs
II	Mean Value Theorems: Rolle's theorem, Lagrange's mean value theorem, Meaning of the sign of derivative, Cauchy's mean value theorem, Higher derivatives, Taylor's theorem, Maclaurin's theorem, Maclaurin's power series for a given function, Expansion of e^x , Expansion of $\sin x$, Expansion of $\cos x$, Expansion of $(1+x)^m$, Expansion of $\log(1+x)$. Partial Differentiation: Introduction, Function of two variables, Neighbourhood of a point (a, b), Continuity of a function of two variables, Limit of a function of two variables, Partial derivatives, Partial derivatives of higher orders, Homogeneous function, Euler's	10 Hrs

	theorem on homogeneous function, Theorem on total differentials, Differentiation of composite function and implicit function.	
III	Integration of Trigonometric Functions: Integration of $\sin^n x$, where n is a positive integer, Reduction formula for integration of $\sin^n x$, Evaluation of the definite integral of $\sin^n x$, Integration of $\cos^n x$, where n is positive integer, Reduction formula for integration of $\cos^n x$, Evaluation of the definite integral of $\cos^n x$. Areas of Plane Regions: Areas of a region bounded by a curve, x-axis and two ordinates. Area enclosed by two curves, Quadrature of hyperbola. Rectification, Lengths of Plane Curves: Introduction, Cartesian equations $y = f(x)$, Other expressions for lengths of arcs. Cartesian equations $x = f(y)$, Parametric Cartesian equations $x = f(t)$, $y = \Phi(t)$, Polar equations $r = f(\theta)$. Volumes and Surfaces of Revolution: Introduction, Volume of a solid of revolution.	10 Hrs
Text Books: 1. Shanti Narayan, P. K. Mittal, "Differential Calculus," Shyam Lal Charitable Trust, Reprint 2018. 2. Shanti Narayan and P.K. Mital, "Integral Calculus," Revised Edition, S. Chand and Company Limited 2008.		
Reference Books: 1. Dr. Gorakh Prasad, "Differential Calculus," New Revised Edition, Pothishala Private Ltd. Reprint 2013. 2. S. C. Malik and Savita Arora, "Mathematical Analysis," New Age International, Limited Publisher 3. Gorakh Prasad, "Integral Calculus," Pothishala Private Limited, 2018. 4. G. B. Thomas and R. L. Finney, "Calculus," 9th Ed. Pearson Education, Delhi, 2005		
Scope: Chapter 4: Articles 4.7, 4.7.1, 4.7.2. [Text Book 1] Chapter 5: Complete [Text Book 1] Chapter 8: Articles 8.1, 8.2, 8.3, 8.5, 8.6, 8.6.1, 8.6.2, 8.6.3. [Text Book 1] Chapter 11: Articles 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.6.1, 11.8, 11.8.1, 11.9, 11.9.1, 11.9.3, 11.9.4. [Text Book 1] Chapter 4: Articles 4.1, 4.1.1, 4.2, 4.2.1. [Text Book 2] Chapter 8: Articles 8.1, 8.1.1, 8.2. [Text Book 2] Chapter 9: Articles 9.1, 9.2, 9.3, 9.3.1, 9.3.2, 9.3.3. [Text Book 2] Chapter 10: Articles 10.1, 10.2. [Text Book 2]		

DSC-2 : Lab Course-I (Based on DSC-1)

Total Credits : 02

Total Contact Hours : 60 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

- i) To learn the derivatives of the functions of one variable.
- ii) To learn the partial derivatives of the functions.
- iii) To learn applications of definite integral for quadrature, rectification and volume of solid of revolution

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Find derivative of hyperbolic, inverse hyperbolic functions and nth derivative of given functions.
- ii) Find the Maclaurin's series expansion of functions.
- iii) Find the partial derivatives of functions.
- iv) Determine areas of plane regions, length of curves and volume of solid of revolution.

Module No.	Topics / actual contents of the syllabus Contact Hours 60
I	To solve examples/ exercise on higher order derivatives (article 5.1).
II	To solve examples/exercise on determination of nth derivatives of rational functions (article 5.3)
III	To solve examples/exercise on the nth derivatives of the products of the powers of sine and cosines (article 5.4).
IV	To solve examples/exercise on Leibnitz's theorem ((article 5.5).
V	To solve examples/exercise on Rolle's theorem (article 8.1)
VI	To solve examples/exercise on Lagrange's mean value theorem (article 8.2)
VII	To solve examples/exercise on Cauchy's mean value theorem (article 8.5)
VIII	To solve examples/exercise on generalised mean value theorem (article 8.6.1)
IX	To solve examples/exercise on partial derivative and partial derivative of higher order (article 11.6 & 11.6.1).
X	To solve examples/exercise on Euler's theorem on homogeneous function (article 11.8.1)
XI	To solve examples/exercise on differentiation of composite function and implicit function (article 11.9.3 & 11.9.4)
XII	To compute the integration of $\sin^n x$ and $\cos^n x$, where n is positive integer. (article 4.1, 4.1.1, 4.2, 4.2.1)

XIII	To solve the problems on areas of a region bounded by a given curve. (articles 8.1, 8.2)
XIV	To evaluate the length of given curve. (articles 9.2, 9.3)
XV	To find volume of solid of revolution. (article 10.2)
Text Books: 1. Shanti Narayan, P. K. Mittal , Differential Calculus, Shyamlal Charitable Trust, Reprint 2018. 2. Shanti Narayan and P.K. Mittal , Integral Calculus, S. Chand and Company Limited Revised Edition 2008, 2013.	
Reference Books: 1. Dr. Gorakh Prasad, "Differential Calculus," New Revised Edition, Pothishala Private Ltd. Reprint 2013. 2. S. C. Malik and Savita Arora, "Mathematical Analysis," New Age International, Limited Publisher, 2017. 3. Gorakh Prasad, "Integral Calculus," Pothishala Private Limited, 2018. 4. G. B. Thomas and R. L. Finney, "Calculus," 9 th Ed. Pearson Education, Delhi, 2005	
Scope: Chapter 4: Articles 4.7, 4.7.1, 4.7.2. [Text Book 1] Chapter 5: Complete [Text Book 1] Chapter 8: Articles 8.1, 8.2, 8.3, 8.5, 8.6, 8.6.1, 8.6.2, 8.6.3. [Text Book 1] Chapter 11: Articles 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.6.1, 11.8, 11.8.1, 11.9, 11.9.1, 11.9.3, 11.9.4. [Text Book 1] Chapter 4: Articles 4.1, 4.1.1, 4.2, 4.2.1. [Text Book 2] Chapter 8: Articles 8.1, 8.11, 8.2. [Text Book 2] Chapter 9: Articles 9.1, 9.2, 9.3, 9.31, 9.32, 9.33. [Text Book 2] Chapter 10: Articles 10.1, 10.2. [Text Book 2]	

SEC-1A : Combinatorial Mathematics

Total Credits : 01
Maximum Marks : 50

Total Contact Hours : 15 Hrs

Learning Objectives of the Course:

- i) Understanding of permutations and combinations
- ii) Learn the circular permutations.
- iii) Learn the division of different things divided into groups.
- iv) Learn pigeonhole principle and inclusion-exclusion principle.

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Apply permutations and combinations.
- ii) Find the number of circular permutations.
- iii) Find the number of ways of selection out of given things.
- iv) Apply pigeonhole principle and inclusion-exclusion principle.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction, Sum rule principle, product rule principle, factorial notation, permutations, permutation of things not all different, circular permutations, To find the number of circular permutation of n different things taken all at a time, Combinations, To find the value of nC_r , division into groups (partitions), To find the number of ways in which $(m + n + p)$ different things be divided into three groups of m , n and p things respectively, To find the total number of ways in which it is possible to make a selection by taking some or all of n things at a time, To find the total number of ways in which a selection can be made out of $p + q + r$ things, of which p are alike of one kind, q alike of second kind and r alike of third kind, To find the value of r for which nC_r is greatest, the pigeonhole principle, the inclusion-exclusion principle.	15 Hrs

Text Books:

1.B.S. Vatsa and Suchi Vatsa, "Discrete Mathematics," Fourth Revised Edition, New Age International Publishers, (2009).

Reference Books:

1.Swapan Kumar Sarkar, "A Textbook of Discrete Mathematics," Ninth edition 2016, S. Chand, (Reprint 2021).

2. Kenneth H. Rosen, "Discrete Mathematics and its Applications," Seventh Edition, McGraw-Hill Book Company, 2011.
3. Krishnamurthy V., "Combinatorics, Theory and Applications," East-West Press, 2008.
4. Brualdi R.A, "Introductory Combinatorics," 5th Edition, Pearson Education Inc., 2009.

Scope:

Chapter 10: Complete.

SEC-1B : Theory of Equations

Total Credits : 01
Maximum Marks : 50

Total Contact Hours :15 Hrs

Learning Objectives of the Course:

- i) Understanding of relation between roots and coefficients.
- ii) Learn the imaginary and surd roots.
- iii) Learn the Descarte's rule of signs.
- iv) Learn the Horner's process.
- v) Learn the cubic and bi-quadratic equations.

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Solve the cubic and bi-quadratic equations.
- ii) Find the imaginary and surd roots.
- iii) Solve the discussion of reciprocal equations.
- iv) Apply the Horner's process.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Every equation of the n^{th} degree has n roots and no more, relation between roots and coefficients, these relation are not sufficient for the solution, cases of solution under given conditions, every case of symmetrical function of the roots, imaginary and surd roots occur in pairs, formation and solution of equation with surd roots, De-Carte rule of signs, value of $f(x+h)$, calculation of $f(x+h)$, by Horner's process, $f(x)$ changes its value gradually, $f(a)$ and $f(b)$ are of contrary signs, roots of an equation of an odd degree and even degree, determination of equal roots, sum of an assigned power of the roots, Transformation of equations, equation with roots of sign opposite to those of $f(x)=0$, equation with roots multiples of those of $f(x)=0$, equation with roots reciprocals of those of $f(x)=0$, discussion of reciprocal equations, equation with roots squares of those of $f(x)=0$, equation with roots exceeding by h those of $f(x)=0$, removal of an assigned term, equation with roots of given functions of those of $f(x)=0$, cubic equations, solution by trigonometry in the irreducible case, bi-quadratic equations, Ferrari's and Decartes solution.	15 Hrs

Text Books:

1.H.S. Hall and S.R. Knight,"Higher Algebra," A.I.T.B.S. Publishers & Distributors, 2003.

Reference Books:

1. S.Bernard, J.M.Child,” Higher Algebra, McMillan and Co.Ltd, 1959

Scope:

Chapter XXXV Articles 534 to 583.

SEC-2 : Lab Course - SEC1A (Based on SEC1A)	
Total Credits : 01	Total Contact Hours : 30 Hrs
Maximum Marks : 50	
Learning Objectives of the Course: i) Understanding of permutations and combinations ii) Learn the circular permutations. iii) Learn the division of different things divided into groups. iv) Learn pigeonhole principle and inclusion-exclusion principle.	
Course Outcomes (COs) : After completion of the course, students will be able to - i) Apply permutations and combinations. ii) Find the number of circular permutations. iii) Find the number of ways of selection out of given things. iv) Apply pigeonhole principle and inclusion-exclusion principle.	
Practical No./ ModuleNo.	Topics / actual contents of the syllabus
I	To solve examples/ exercise on permutations
II	To solve examples/exercise on circular permutations
III	To find the number of circular permutation of n different things taken all at a time
IV	To find the value of nC_r and division into groups
V	To find the number of ways in which $(m + n + p)$ different things be divided into three groups of m , n and p things respectively
VI	To find the total number of ways in which it is possible to make a selection by taking some or all of n things at a time
VII	To find the total number of ways in which a selection can be made out of $p + q + r$ things, of which p are alike of one kind, q alike of second kind and r alike of third kind
VIII	To find the value of r for which nC_r is greatest.
Text Books: 1.B.S. Vatsa and Suchi Vatsa,"Discrete Mathematics," Fourth Revised Edition, New Age International Publishers, (2009)...	
Reference Books: 1.Swapan Kumar Sarkar," A Textbook of Discrete Mathematics," Ninth edition 2016, S. Chand, (Reprint 2021).	

2. Kenneth H. Rosen," Discrete Mathematics and its Applications," Seventh Edition, McGraw-Hill Book Company
3. Krishnamurthy V., "Combinatorics, Theory and Applications," East-West Press, 2008.
4. Brualdi R.A,"Introductory Combinatorics," 5th Edition, Pearson Education Inc., 2009.

Scope:

Chapter 10 : Complete

SEC-2 : Lab Course - SEC1B (Based on SEC1B)

Total Credits : 01
Maximum Marks : 50

Total Contact Hours : 30 Hrs

Learning Objectives of the Course:

- i) Understanding of relation between roots and coefficients.
- ii) Learn the imaginary and surd roots.
- iii) Learn the Descarte's rule of signs.
- iv) Learn the Horner's process.
- v) Learn cubic and bi-quadratic equations.

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Solve the cubic and bi-quadratic equations.
- ii) Find the imaginary and surd roots.
- iii) Solve the discussion of reciprocal equations.
- iv) Apply the Horner's process.

Practical No. ModuleNo.	Topics / actual contents of the syllabus
I	To solve examples on relation between roots and coefficients
II	To solve examples/exercise on solutions under given conditions
III	To solve examples on imaginary and surd roots
IV	To solve examples/exercise on formation and solutions of equation with surd roots.
V	To solve examples/exercise using Horner's process
VI	To solve examples on roots of an equation with odd and even degree, determination of equal roots
VII	To solve examples on transformation of equations, equations with roots of opposite sign, multiple roots, and reciprocal roots
VIII	To solve examples/exercise on cubic equations and bi-quadratic equations

Text Books:

1.H.S. Hall and S.R. Knight,"Higher Algebra," A.I.T.B.S. Publishers & Distributors, 2003.

Reference Books:

1. S.Bernard, J.M.Child," Higher Algebra, McMillan and Co.Ltd, 1959

Scope: Chapter XXXV Articles 534 to 583.

This course will be available for the students from other faculty		
GE/OE-1 : Business Mathematics-I		
Total Credits : 02		Total Contact Hours : 30 Hrs
Maximum Marks : 50		
Learning Objectives of the Course: i) Learn the concepts of ratio and proportion. ii) Learn the calculations of retail market , rates and currency conversions. iii) Learn the various types of discounts. i) Learn the basics of function, system of equations and profit volume analysis.		
Course Outcomes (COs) : After completion of the course, students will be able to - i) Apply knowledge of ratios and proportions. ii) Apply currency and discounts to business. iii) Identify the functions and linear functions. iv) Apply the identified functions to cost and profit.		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Ratios, Proportions, Ratios with more than two quantities, Retail calculations, Rates and currency conversions.	10 Hrs
II	Trade discounts , Cash discounts, Example of a function, Linear functions, Cost function.	10 Hrs
III	Equations and functions, System of equations, Profit volume analysis.	10 Hrs
Text Books: 1.Chis Kellman, Leslie Major, Don Mallary, Frank Gruen, Amy Goldiest," Business Mathematics," BCIT (2021)		
Reference Books: 1. Singh J. K., "Business Mathematics," Himalaya Publishing House, 2021. 2. Vohra N.D.," Business Mathematics and Statistics," McGraw Hill Education (India) Pvt. Ltd, 2012		
Scope: Chapter-1: 1.1 to 1.7. Chapter- 2 : 2.1 to 2.6		

Semester – II

DSC-3 : Differential Equations

Total Credits : 02

Total Contact Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

- i) Learn the first order linear differential equations.
- ii) Identify and solve the exact differential equations.
- iii) Learn the general and short method of solution.
- iv) Learn linear homogeneous differential equations

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Determine the solution of first order linear differential equations.
- ii) Determine the solution of exact differential equations.
- iii) Determine the solution of linear equations with constant coefficient using general and short method.
- iv) Determine the solution of linear homogeneous differential equations.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Differential Equations: Ordinary and partial differential equations, Order and degree, Solutions and constants of integration, The derivation of a differential equation, Solutions, general, particular, singular. Equations of the first order and the first degree: Equations of the form $f_1(x)dx + f_2(y)dy = 0$, Equations homogeneous in x and y, non-homogeneous equations of the first degree in x and y, Exact differential equations, Condition that an equation of the first order be exact, Rule for finding the solution of an exact differential equation. Integrating factors, Linear equations, Equations reducible to the linear form.	10 Hrs
II	Linear equations with constant coefficients: Linear equations defined, The Complementary Function, The particular integral, The complete solution, The linear equation with constant coefficients and second member zero, Case of the auxiliary equation having equal roots, Case of the auxiliary equation having imaginary The symbol D, The linear equation with constant coefficients and second member a function of x, The symbolic function $1/f(D)$, Methods of finding the particular integral. Short methods of finding the particular integrals in certain cases: Integral corresponding to a term of the form e^{ax} , x^m , $\sin ax$ or $\cos ax$ in the second member, Integral corresponding to a term of the form $e^{ax}V$ and xV in the second member.	10 Hrs

III	Linear equation with variable coefficients: The homogeneous linear equation, first method of solution, Second method of solution: (A) To find the complementary function, Second method of solution: (B) To find the particular integral, The symbolic functions $f(\theta)$ and $1/f(\theta)$, Methods of finding the particular integral, Integral corresponding to a term of the form x^a in the second member, Equations reducible to the homogeneous linear form.	10 Hrs
Text Books: 1. Daniel A. Murray, "Introductory Course in Differential Equations," Khosala Publishing House, New Delhi 2003 .		
Reference Books: 1. M.D. Raisinghania, "Ordinary and Partial Differential Equations," S. Chand and Company Limited, 2022. 2. G. Birkhoff and G.C. Rota, "Ordinary Differential Equations," John Wiley and Sons, 1989. 3. Frank Ayres, "Theory and Problems on Differential Equations," McGraw Hill Co. Ltd.. 4. George F. Simmons, "Differential Equations with Applications and Historical Notes," Tata McGraw Hill Publishing House Limited, 2017.		
Scope: Chapter I: Art. 1 to 4. Chapter II: Art. 8 to 14, 20, 21. Chapter VI: Art 49 to 53, 56 to 64. Chapter VII: Art 65 to 71.		

DSC-4 : Lab Course –II (Based on DSC-3)

Total Credits : 02

Total Contact Hours : 60 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

- i) Learn the first order linear differential equations.
- ii) Identify and solve the exact differential equations.
- iii) Learn the general and short method of solution.
- iv) Learn linear homogeneous differential equations

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Determine the solution of first order linear differential equations.
- ii) Determine the solution of exact differential equations.
- iii) Determine the solution of linear equations with constant coefficient using general and short method.
- iv) Determine the solution of linear homogeneous differential equations.

Practical No. ModuleNo.	Topics / actual contents of the syllabus
I	To solve the problems on equations homogeneous in x and y
II	To solve non-homogeneous equations of the first degree in x and y.
III	To solve the problems on Exact differential equations.
IV	To solve the problems on linear equations and equations reducible to the linear form.
V	To find the solution of linear equation with constant coefficients and second member zero. (Including the case of the auxiliary equation having equal/unequal roots)
VI	To find the solution of linear equation with constant coefficients and second member zero. (Including the case of the auxiliary equation having imaginary roots).
VII	To solve the problems on methods of finding the particular integral by general methods.
VIII	To solve the problems on integral corresponding to a term of the form e^{ax} in the second member.
IX	To solve the problems on integral corresponding to a term of the form x^m in the second member.
X	To solve the problems on integral corresponding to a term of the form $\sin ax$ or $\cos ax$ in the second member.
XI	To solve the problems on integral corresponding to a term of the form $e^{ax}V$ in the second member.
XII	To solve the problems on integral corresponding to a term of the form xV

	in the second member.
XIII	To solve the problems on the homogeneous linear differential equations with variable coefficient by first method of solution.
XIV	To solve the problems on the homogeneous linear differential equation variable coefficient by the second method of solution. (To find the complementary function and particular integral)
XV	To solve the problems on the equations reducible to the homogeneous linear differential equation with variable coefficient.
<i>Text Books:</i> 1. Daniel A. Murray, “Introductory Course in Differential Equations,” Khosala Publishing House, New Delhi 2003 .	
<i>Reference Books:</i> 1. M.D.Raisinghania, “Ordinary and Partial Differential Equations,” S.Chand and Company Limited, 2022. 2. G.Birkhoff and G.C.Rota, “Ordinary Differential Equations,” John Wiley and Sons, 1989. 3. Frank Ayres, “Theory and Problems on Differential Equations,” McGraw Hill Co. Ltd.. 4. George F.Simmons, “Differential Equations with Applications and Historical Notes,” Tata McGraw Hill Publishing House Limited, 2017.	
<i>Scope:</i> Chapter I: Art. 1 to 4. Chapter II: Art. 8 to 14, 20, 21. Chapter VI: Art 49 to 53, 56 to 64. Chapter VII: Art 65 to 71.	

VSC-1A : Financial Accounting		
Total Credits : 01 Maximum Marks : 50		Total Contact Hours : 15 Hrs
Learning Objectives of the Course: - i) Understanding of accounting and financial terminology. ii) Learn the financial transactions. iii) Assess the financial performance of the company. Course Outcomes (COs) : After completion of the course, students will be able to - i) Apply the basic accounting and financial terminology. ii) Perform the financial transactions. iii) Use the financial statements to assess a company's performance.		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to Accounting: Importance and Limitations of accounting. Various concepts of Accounting Information, Accounting Principles, Conventions and Concepts. Journal, Ledger, Trial Balance, Rectification of Errors, Preparation of Bank Reconciliation, final Accounts with Adjustment entries. Valuation of Stock, Accounting Treatment of Depreciation, Reserve and Provision. Analysis of Financial Statement: Ratio Analysis.	15 Hrs
Text Books: 1. Narayanswami R., " Financial Accounting Managerial Perspective," Second Edition, Prentice Hall of India Pvt. Ltd., 2005.		
Reference Books: 1. Mukherjee, A., and Hanif, M., "Financial Accounting," First Edition,. Tata Mc. Graw Hill, 2003. 2. Maheshwari, S.N., and Maheshwari, S. K., " An Introduction to Accountancy" 11 th Edition, Vikas Publishing House 2013. 3. Bhattacharya, A.K., " Essentials of Financial Accounting, " 2nd Edition. Prentice Hall of India Pvt. Ltd., 2011. 4. Chowdhary A., " Fundamentals of Accounting and Financial Analysis,". First Edition, Pearson Education, 2007.		

VSC-1B : Basic Statistics		
Total Credits : 01 Maximum Marks : 50		Total Contact Hours : 15 Hrs
Learning Objectives of the Course: - i) Learn the basic concepts of statistics. ii) Learn and analyze the scattered diagram or dot diagram. Course Outcomes (COs) : After completion of the course, students will be able to - i) Determine the mean, mode, median and deviation for the given data. ii) Apply the concepts of probability.		
Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Statistics: Statistics, Frequency distribution, Graphical representation, Average or Measures of central tendency, Arithmetic mean, median, mode, Geometric mean, Harmonic mean, Average deviation or mean deviation, Standard deviation, Shortest method for calculating standard deviation, Moments, Moment generating function, Skewness, Co-relation, Scattered diagram or dot diagram. Probability: Probability, Definitions, Addition law of probability, Multiplication law of probability, Conditional probability, Baye's theorem (Only statement).	10 Hrs
Text Books: 1. H.K.Das, "Advanced Engineering Mathematics," Twenty first revised edition, S.Chand and Company Pvt.Ltd., Reprint 2016.		
Reference Books: 1. Irwin Miller, Marylees Miller, John E., " Freund's Mathematical Statistics with Applications," Seventeenth Edition., Pearson Education, Asia, 2012. 2. A.M. Mood, F.A. Graybill, D.C. Boes, " Introduction to the Theory of Statistics, Tata McGraw-Hill, 2007.		
Scope: Chapter -10 : 10.1 to 10.17. Chapter -11 : 11.1 to 11.6.		

VSC-2 : Lab Course -VSCA (Based on VSC1A)

Total Credits : 01

Total Contact Hours : 30 Hrs

Maximum Marks : 50

Learning Objectives of the Course:

- i) Understanding of accounting and financial terminology.
- ii) Learn the financial transactions.
- iii) Assess the financial performance of the company.

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Apply the basic accounting and financial terminology.
- ii) Perform the financial transactions.
- iii) Use the financial statements to assess a company's performance

Practical No. ModuleNo.	Topics / actual contents of the syllabus
I	To solve examples on accounting.
II	To solve examples/exercise on journals.
III	To solve examples /exercise on ledger.
IV	To solve examples/exercise on trial balance and rectification of errors.
V	To solve examples/exercise reconciliation.
VI	To solve examples on final accounts.
VII	To solve examples/exercise valuation of stock.
VIII	To solve examples/exercise on ratio analysis

Text Books:

- I. Narayanswami R., " Financial Accounting Managerial Perspective," Second Edition, Prentice Hall of India Pvt. Ltd., 2005.

Reference Books:

- 1.Mukherjee, A., and Hanif, M., "Financial Accounting," First Edition,. Tata Mc. Graw Hill, 2003.
2. Maheshwari, S.N., and Maheshwari, S. K., " An Introduction to Accountancy" 11 th Edition, Vikas Publishing House 2013.
3. Bhattacharya, A.K., " Essentials of Financial Accounting, " 2nd Edition. Prentice Hall of India Pvt. Ltd., 2011.
4. Chowdhary A., " Fundamentals of Accounting and Financial Analysis,"First Edition, Pearson Education,2007.

VSC-2 : Lab Course -VSCB (Based on VSC1B) Total Credits : 01 Total Contact Hours : 30 Hrs Maximum Marks : 50	
Learning Objectives of the Course: i) Learn the basic concepts of statistics. ii) Learn and analyze the scattered diagram or dot diagram. Course Outcomes (COs) : After completion of the course, students will be able to - i) Determine the mean, mode, median and deviation for the given data. ii) Apply the concepts of probability.	
Practical No. ModuleNo.	Topics / actual contents of the syllabus
I	To solve examples on frequency distribution and measure of central tendency.
II	To solve examples/exercise on arithmetic mean, median and mode.
III	To solve examples on imaginary and surd roots
IV	To solve examples/exercise on geometric mean, harmonic mean and mean deviation.
V	To solve examples/exercise on standard deviation.
VI	To solve examples on moments, moment generating function, correlation.
VII	To solve examples on scattered diagram.
VIII	To solve examples/exercise on probability
Text Books: 1. H.K.Das, “Advanced Engineering Mathematics,” Twenty first revised edition, S.Chand and Company Pvt.Ltd., Reprint 2016.	
Reference Books: 1. Irwin Miller, Marylees Miller, John E., “ Freund’s Mathematical Statistics with Applications,” Seventeenth Edition., Pearson Education, Asia, 2012. 2. A.M. Mood, F.A. Graybill, D.C. Boes, “ Introduction to the Theory of Statistics, Tata McGraw-Hill, 2007.	

This course will be available for the students from other faculty		
GE/OE-2 : Matrices Total Credits : 02 Total Contact Hours : 30 Hrs Maximum Marks : 50		
Learning Objectives of the Course: i) Learn the fundamentals of matrices. ii) Determine the determinant of square matrix and minors of matrix. iii) Perform the operation on matrices and study its properties. iv) Identify the rank of matrix and solve the system of equations. Course Outcomes (COs) : After completion of the course, students will be able to - i) Apply the operations of matrices. ii) Apply the properties of matrices. iii) Find the determinant of square matrix and minors. iv) Solve system of equations.		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Matrices, Different types of matrices, some special types of matrices, sub-matrix of a matrix, Determinant of a square matrix, Minors of matrix, Sum of matrices, difference of matrices, some theorems.	10 Hrs
II	Product of matrices, Reversal law for the transpose of a product, Associate Law, Distributive Law, Some Special types of matrices, Adjoint of a square matrix, Inverse of a matrix, Matrix Division, Partitioning of Matrices.	10 Hrs
III	Rank of Matrix, Elementary transformations of matrix, Theorems, Reduction to Normal form, Elementary matrices, Elementary Transformations and elementary matrices, Rank of a product. System of linear homogeneous equations, systems of linear non-homogeneous equations, Applications to Geometry.	10 Hrs
Text Books: 1.Shanti Narayan, P.K.Mittal, "A Textbook of Matrices," S Chand & Company Ltd. 2009.		

Reference Books:

1. Suddhendu Biswas, "Text Book of Matrix Algebra," Third edition, Prentice Hall of India, 2012.
2. Joel N. Franklin, "Matrix Theory," Dover Publications, 2023.
3. Dennis S. Bernstein, "Matrix Mathematics," University Press, 2009.
4. Vinit K.Sinha, "Introduction to Matrix Theory," Alpha Science, 2015.

Basket 1: List of Major subjects in Science (DSC)

Students willing to pursue their bachelors in the **Faculty of Science and Technology** shall choose any three subjects (from the following options) as Major 1, Major 2 and Major 3 (Based on the available options in the respective college)

Semester	Sr No	BOS / Ad hoc Board proposing the course	Title of the Course
1st and 2nd Semester <i>(Students shall choose any three subjects (from these options) as Major 1, Major 2 and Major 3 (Based on the available options in the respective college))</i>	1	BOS in Botany	Botany
	2	BOS in Chemistry	Chemistry
			Analytical Chemistry
			Polymer Chemistry
	3	BOS in Mathematics	Mathematics
	4	BOS in Physics	Physics
			Non-Conventional and Conventional Energy
			Instrumentation Practice
	5	BOS in Zoology	Zoology
	6	BOS in Electronics	Electronics
	7	BOS in Fishery Science	Fishery Science
	8	BOS in Microbiology	Microbiology
	9	Ad Hoc Board in Statistics	Statistics
	10	Ad hoc Board in Industrial Chemistry	Industrial Chemistry
	11	Ad hoc Board in Dairy Science & Technology	Dairy Science & Technology
	12	Ad hoc Board in Biotechnology and Bioinformatics	Biotechnology
			Bioinformatics
	13	Ad hoc Board in Biochemistry	Biochemistry
	14	Ad hoc Board in Home Science	Home Science
	15	Ad Hoc Board in Agrochemical Fertilizers, Horticulture, Dry land Agriculture	Agrochemical Fertilizers
			Horticulture
	16	Ad hoc Board in Forensic Science	Forensic Science
			Forensic Science & Cyber Security
	17	Ad Hoc Board in Computer Science	Computer Science
			Computer Application
			Information Technology
			Data Science
	18	Ad Hoc Board in Networking and Multimedia	Networking and Multimedia
	19	Ad Hoc Board in Environmental Science	Environmental Science
	20	BOS in Fishery Science	Fishery Science
	21	Ad hoc Board in Automobile Technology / Workshop Technology / Refrigerator and Air Conditioning	Automobile Technology
			Workshop Technology
			Refrigerator and Air

			Conditioning
	22	Ad hoc Board in Geology	Geology

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