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

..2..

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 Sambhajinagar
-431 004.
REF.NO. SU/SCI./2024/27128-35
Date:-27.05.2024.

★
★
★
★
★
★★★★★
★

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 Sambhajinagar.

2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 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, Preforming 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 nth derivatives: Some standard results, Determination of nth derivative of rational functions, The nth derivatives of the products of the powers of sines and cosines, Leibnitz's theorem: The nth 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 $sinx$, Expansion of $cosx$, 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," Shyamlal 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, 8.11, 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]

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," 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, 8.11, 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 Total Contact Hours : 15 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.

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 Total Contact Hours :15 Hrs
Maximum Marks : 50

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 ${}^{n}C_{r}$ 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 ${}^{n}C_{r}$ 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 Total Contact Hours : 30 Hrs
Maximum Marks : 50

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/exerxise 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, sinax or cosax 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 *sinax* or *cosax* 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.

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.

VSC-1A : Financial Accounting

Total Credits : 01 Total Contact Hours : 15 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.

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 Total Contact Hours : 15 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.

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:

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-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 artihmetic 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, corelation.
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 *(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)*	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

==========xxxxxxxxxxxxxxxxxxx==========

Dr.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

CIRCULAR NO.SU/B.Sc./CBC&GS /64/2023

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies, Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Practical Pattern of Question Paper under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc.Mathematics(Optional)	IIIrd & IVth semester
2.	B.Sc. Environmental Science (Optional)	IIIrd & IVth semester
3.	B.Sc. Bioinformatics (Degree)	IIIrd & IVth semester

This is effective from the Academic Year 2023-24 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,
Aurangabad-431 004.
REF.NO.SU/2023/29372-79
Date:- 18.05.2023.

★
★
★
★
★★★★★

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.BAMU,A'bad.

2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
6] The Public Relation Officer, Dr.BAMU,A'bad.
7] The Record Keeper, Dr.BAMU,A'bad.

DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

AURANGABAD-431004 (MS) INDIA

Undergraduate Bachelor Degree Program in Science and Technology

B.Sc. **Mathematics**

B.Sc.Second Year (Semester-III & IV)

Course Structure and Curriculum

Choice Based Credit and Grading System

(Effective from Academic Year 2023-2024)

11/05/23

Dr. J. A. Nanaware

24/4/2023

(Dr. Bhausaheb R. Sontakke)

Chairman,
Syllabus Committee.

Dr.Babasaheb Ambedkar Marathwada University

Aurangabad-431004 (MS) India

Course Structure of **B.Sc.(Mathematics) Second Year** (Semester-III and Semester-IV)

B.Sc. Second Year (Semester-III)								
	Course Code	Course Title	Total Periods (Teaching Periods /week)	Credits	Scheme of Examination			
					Max. Marks	CIA	UA	Min. Marks
DSC-1C Core Courses	**MAT-301 Paper -V**	**Differential Equations**	**60(5/week)**	**3**	**50**	**10**	**40**	**20**
	MAT-302 Paper-VI	**Laplace and Fourier Transforms**	**60(5/week)**	**3**	**50**	**10**	**40**	**20**
SEC-1 Elective Course (Any One)	**MAT-303 Paper-VII**	**Mechanics-I**	**60(5/week)**	**3**	**50**	**10**	**40**	**20**
	MAT-304 Paper-VIII	**Graph Theory**	**60(5/week)**	**3**	**50**	**10**	**40**	**20**
				9	150	30	120	60
Total Credits for Semester-III: 09								

B.Sc. Second Year (Semester-IV)								
	Course Code	Course Title	Total Periods (Teaching Periods /week)	Credits	Scheme of Examination			
					Max. Marks	CIA	UA	Min. Marks
DSC-1D Core Courses	**MAT-401 Paper-IX**	**Partial Differential Equations**	**60(5/week)**	**3**	**50**	**10**	**40**	**20**
	MAT-402 Paper-X	**Numerical Analysis**	**60(5/week)**	**3**	**50**	**10**	**40**	**20**
SEC-2 Elective Course (Any One)	**MAT-403 Paper-XI**	**Mechanics-II**	**60(5/week)**	**3**	**50**	**10**	**40**	**20**
	MAT-404 Paper-XII	**Complex Analysis**	**60(5/week)**	**3**	**50**	**10**	**40**	**20**
				9	150	30	120	60
Total Credits for Semester-IV: 09								

UA- University Assessment **CIA-** Continuous Internal Assessment

Note: CIA **: Internal Test -05** Marks and **Assignment/Tutorial-05** Marks

(Two internal tests of 05 marks each be conducted and average of the two tests will be considered)

Dr. J. A. Nanaware

24/4/2023

(Dr. Bhausaheb R. Sontakke)
Chairman
Syllabus Committee

Dr.Babasaheb Ambedkar Marathwada University
Aurangabad-431004 (MS) India

Curriculum of B.Sc. (Mathematics) Second Year (Semester-III and Semester-IV)

B.Sc.Second Year (Semester-III)

Course Code: **MAT-301** Course Name: **Differential Equations**

Credits :**03** Total Periods: **60**

Course Objectives:

Student will learn the basic methods of finding solutions of differential equations.

Course Outcomes:

CO1: Determine solution of first order linear differential equation

CO2: Determine solution of exact differential equation

CO3: Determine solution of linear equation with constant coefficient using general and short method

CO4: Determine solution of linear homogeneous differential equation

Unit-I: Equations of the First Order and of the First Degree

Ordinary and partial differential equations, Order and degree, Solution and constant of integration, Derivation of differential equation, Equation 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 to be exact, Rules for finding the solution of an exact differential equation. Integrating factors, The number of integrating factors is infinite, Integrating factors found by inspections. Rules for finding integrating factors, Rules *I&II*, Rules *III&IV*, Rule *V*, Linear equations, Equation reducible to the linear form.

9/8/1-2019

(Dr. Bhausaheb R. Sontakke)
Chairman.

Unit-II: Equations of the First Order but not of First Degree

Equations that can be resolved into component equations of the first degree, Equations that can't be resolved into component equations, Equations solvable for y, Equation solvable for x, Equations that do not contain x, that do not contain y, Equations homogeneous in x and y, Equations of first degree in x & y: Clairaut's equation.

Unit-III: 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 roots, The symbol D, Theorem concerning D, Another way of finding the solution when the auxiliary equation has repeated roots,The linear equation with constant coefficients and a second member a function of x, The symbolic function $1/f(D)$, Methods of finding the particular integral. Short method of finding the particular integrals in certain cases: Integral corresponding to a term of the form e^{ax},x^m,sinax or cosax in the second member, Integral corresponding to a term of the form $e^{ax}V$ and xV in the second member.

Unit-IV: Linear Equations with Variable Coefficients

The homogeneous linear equation first method of solution, Second method of solution:(A) To find the complementary function,(B) To find the particular integral, The symbolic function $f(\theta)$ and $1/f(\theta)$, Method of finding the particular integral, Integral corresponding to a term of the form x^m in the second member, Equation reducible to the homogeneous linear form.

Recommended Text Book:

Daniel A. Murray: Introductory Course in Differential equations, Khosala Publishing House, New Delhi.

Scope:

Unit I. : Chapter I: Art. 1 to 3, Chapter II: Art. 8 to 21.
Unit-II : Chapter III: Art 22 to 28(Complete)
Unit-III: Chapter VI: Art 49 to 64
Unit-IV :,Chapter VII: Art 65 to 71

Reference Books:

1. M.D.Raisinghania: Ordinary and Partial Differential Equations, S.Chand and Company Limited.
2. G.Birkhoff and G.C.Rota: Ordinary Differential Equations, John Wiley and Sons.
3. Frank Ayres: Theory and Problems on Differential Equations, McGraw Hill.
4. George F.Simmons: Differential Equations with Applications and Historical Notes, Tata McGraw Hill Publishing House Limited.

Course Code: **MAT-302** Course Name: **Laplace and Fourier Transforms**

Credits:**03** Total Periods: **60**

Course Objectives:

Student will learn the fundamental properties of Laplace and Fourier transforms.

Course Outcomes:

CO1: Determine Laplace transform for various functions and understand the properties of Laplace transforms

CO2: Determine inverse Laplace transform, properties of inverse Laplace Transform, and solve the problems using convolution theorem

CO3: Determine Fourier transform and understand the properties of Fourier transform, Fourier sine and cosine transforms

CO4: Apply Laplace transform to find solutions of differential equations.

Unit I: Beta Function, Gamma Function and Laplace Transforms

Beta and Gamma functions, Elementary properties of Gamma function, Relation between Beta and Gamma functions. Introduction, Laplace Transform, Important Formulae, Properties of Laplace Transforms, Laplace Transform of the Derivative of $f(t)$, Laplace Transform of the Derivative of Order n, Laplace Transform of Integral of $f(t)$, Laplace Transform of $t.f(t)$ (Multiplication by t), Laplace Transform of $1/t\ f\ (t)$ (Division by t), Unit Step Function, Second Shifting Theorem, Impulse Function, Periodic Functions, Convolution Theorem, Evaluation of Integrals, Formulae of Laplace Transform, Properties of Laplace Transform.

Unit II: Inverse Laplace Transforms

Inverse Laplace Transforms, Important Formulae, Multiplication by s, Division by s (Multiplication by 1/s), First Shifting Property, Second Shifting Property, Inverse Laplace Transforms of Derivatives, Inverse Laplace Transform of Integrals, Partial Fractions Method, Inverse Laplace Transform by Convolution.

Unit III: Solutions of Differential Equations and Integral Transforms

Solution of Differential Equations by Laplace Transforms, Solution of Simultaneous Differential Equations by Laplace Transforms

Unit IV: Fourier Transforms

Introduction, Integral Transforms, Fourier Integral Theorem, Fourier Sine and Cosine Integrals, Fourier's Complex Integral, Fourier Transforms, Fourier Sine and Cosine Transforms, Properties of Fourier Transforms.

Recommended Text Book:

1. **J.N.Sharma, A. R.Vasishtha:** Real Analysis, Krishna Prakashan Media Pvt.Ltd., Meerut.
2. **H.K.Dass**: Advanced Engineering Mathematics, S.Chand & Company Ltd.(2004)

Scope:

Unit I: **(Chapter 14)** Article 9,10,13 [1]
(Chapter13) Articles13.1 to 13.15, Article 13.17 to 13.19 [2]

Unit II: **(Chapter13)** Articles13.20 to 13.29 [2]

Unit III: **(Chapter13)** Articles13.30 to 13.31 [2]

Unit IV: **(Chapter14)** Articles14.1 to 14.8 [2]

Reference Books:

1. Grove A.C.: An Introduction to Laplace Transforms and Z-Transforms, Prentice Hall 1991.
2. Doetsch G.: Introduction to Theory and Application of Laplace Transforms, Springer Verlag,1990.
3. Murray Spigel: Schaum Outline of Laplace Transforms, Schaum Outline Series, Mc-Graw Hill 2012.
4. Joel L.Schiff: The Laplace Transforms:Theory and Applications, Springer,2008.
5. R.J.Becrends, H.G.Morsche J.C.Vande Berg and E.M.Vande Vrie: Fourier and Laplace Transform,Cambridge Press,2003.

Course Code: **MAT-303** Course Name: **Mechanics-I**

Credits:**03** Total Periods: **60**

Course Objectives:

Students will be able to describe forces, resultant of forces, vector moment of forces, moment of couple, laws and rules

Course Outcomes:

CO1: Describe different types of forces, triangle law of forces, Parallelogram of forces, resultant of forces, sine rule and cosine rule

CO2: Explain resultant of several co-planar forces, equation of the line of action of the resultant, equilibrium of a rigid body under three co-planar forces

CO3: Explain Lami's theorem and polygon of forces

CO4: Explain vector moment of a force and vector moment of couple and describe basic concepts of centre of gravity and its applications

Unit I : Forces Acting on a Particle

Particle, Rigid body, Force, The force as a vector, Equilibrium, An Axiom for the equilibrium of two forces, Statics, Resultant of forces, Law of a parallelogram of forces, Principle of transmissibility of forces, Deductions, Resultant of forces m.OA and n.OB, Components and resolved parts, The algebraic sum of resolved parts of two forces,To find the magnitude and direction of the resultant of any number of co-planar forces acting at a point, Resultant of parallel forces.

Unit II: Equilibrium of Forces Acting on a Particle

Triangle law of forces, Converse of the triangle law of forces, Polygon of forces, Lami's theorem, Conditions of equilibrium of forces acting on a particle.

Unit III: Forces Acting on a Rigid Body

Introduction, Moment of a force, Sum of vector moments of two like parallel forces, Couples, Conditions of equilibrium of forces acting on a rigid body, Trigonometrical Theorems.

Unit-IV: Centre of Gravity

Centroid of weighted points, Centre of gravity, Center of gravity of some uniform bodies.

Recommended Text Book:

V.Tulsani, T.V.Warehekar, N.N.Saste: Mechanics and Differential Geometry Second Edition (1987) , S.Chand and Co.(Pvt.)Ltd., New Delhi.

Scope: Part-I : Statics

Chapter (1): Complete

Chapter (2): Complete

Chapter (3): Complete

Chapter (4): Articles 4.1 to 4.7

Reference Books:

1. S.L.Loney: An Elementary Treatise on Statics, AITBS Publishers and Distributors, New Delhi.

2. B.R.Thakur, G.P.Shrivastava : Mechanics,Ram Prasad and Sons, Agra-3.

3. M.L.Khanna: Statics, Kedarnath Ramnath Prakashan, Meerut.

Course Code: **MAT-304** Course Name: **Graph Theory**

Credits :**03** Total Periods**: 60**

Course Objectives:

Student will be able to analyse the graphs, trees and apply it to solve problems.

Course Outcomes:

CO1: Describe and identify the type of graphs

CO2: Explain isomorphism and connectedness of graphs

CO3: Explain and understand the properties of trees

CO4: Understand cut-sets , cut-vertices and its properties

Unit I. Introduction

What is a Graph?, Application of Graphs, Finite and Infinite Graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex and Null Graph.

Unit II. Paths and Circuits

Isomorphism, Subgraphs, Walks, Paths, and Circuits, Connected Graphs, Disconnected Graphs, and Components, Euler Graphs, Operations on Graphs, More on Euler Graphs, Hamiltonian Paths and Circuits, The Traveling Salesman Problem.

Unit III. Trees and Fundamental Circuits

Trees, Some Properties of Trees, Pendant Vertices in a Tree, Distance and Centers in a Tree Rooted and Binary Trees, On Counting Trees, Spanning Trees,Fundamental Circuits, Spanning Trees in a Weighted Graph.

Unit IV. Cut-Sets and Cut-Vertices

Cut-Sets, Some Properties of a Cut-Set, All Cut-Sets in a Graph, Fundamental Circuits and Cut-Sets,Connectivity and Separability.

Recommended Text Book :

Narsingh Deo : Graph Theory with Applications to Engineering and Computer Science, Printice-Hall of India Pvt. Lt. New Delhi.(2010)

Scope: Unit 1 : Chapter 1: Sec.1.1 to 1.5

Unit 2: Chapter 2: Sec. 2.1 to 2.2, 2.4 to 2.10

Unit 3: Chapter 3: Sec. 3.1 to 3.8, 3.10

Unit 4: Chapter 4 : Sec. 4.1 to 4.5

Reference books:

1. John Clark and Derek Holton: A First Look at Graph Theory (Allied Publishers)
2. C.L.Liu: Elements of Discrete Mathematics, Tata Mc-Graw Hill, Fourth Edition
3. Robin J. Wilson: Introduction to Graph Theory, Fourth Edition (low price edition)
4. Douglas West: Introduction to Graph Theory, Second edition.
5. R.Balakrishnan, K.Ranganathan: A Textbook of Graph Theory

B.Sc. Second Year (Semester-IV)

Course Code: **MAT-401** Course Name: **Partial Differential Equations**

Credits:**03** Total Periods: **60**

Course Objectives:

Student will learn the methods of finding solutions of partial differential equations.

Course Outcomes:

CO1: Solve Lagrange's equation

CO2: Find different types of solutions like complete integral, Singular integral and general integral

CO3: Determine the solution of partial differential equations using Charpit's Method

CO4: Describe Monge's Method, Method of transformation

Unit I:

Partial differential equation (PDE), Order and method of forming PDE, solution of equations by direct integration, Lagrange's linear equations, method of multipliers.

Unit II:

Partial differential equations non-linear in p and q, Charpit's method, Linear homogeneous PDE of n^{th}order with constant coefficients, Rules for finding the complementary functions, Rules for finding the particular integral.

Unit III:

Non-homogeneous linear equations, Monge's method, Method of separation of variables, Equations of vibrating strings, Solution of the wave equation by D'Almberts method.

Unit IV:

One-dimensional heat flow, Two-dimensional heat flow, Laplace equations in polar co-ordinates, Transmission line equations.

(Dr. Bhausaheb R. Sontakke)
chairman.

Recommended Text Book:

H.K.Dass: Advanced Engineering Mathematics, S.Chand and Company Ltd.(2004).

Scope:

Unit I: Chapter 9 : 9.1,9.2,9.3,9.4,9.5,9.6,9.7.

Unit II: Chapter 9 : 9.8,9.9,9.10,9.11,9.12.

Unit III: Chapter 9 : 9.13,9.14,9.15,9.16,9.17,9.18.

Unit IV: Chapter 9 : 9.19,9.20, 9.21, and 9.22.

Reference Books:

1. D.A.Murray: Introductory course in Differential equation, NewYork Longmans and Green Co. London and Bombay.
2. M.D.Raisinghania: Ordinary and Partial Differential equations, S.Chand and Co.
3. T.M.Karade: Lectures on Differential equation, Sonu-Nilu Pub. Nagpur.
4. I.N.Sneddon: Elements of Partial Differential Equation, McGraw Hill co.
5. Peter Olver: Introduction to Partial Differential equation Springer Cham Heidelberg NewYork Dordrecht London.
6. A.Singaravelu: Engineering Mathematics, Engineering Mathematics, Meenakshi Agency Chennai.
7. W.E.Williams: Partial Differential equations, Claredon Press Oxford.
8. M.E.Tayor: Partial Differential equations, Springer Cham Heidelberg NewYork Dordrecht London.

Course Code: **MAT-402** Course Name: **Numerical Analysis**

Credits:**03** Total Periods: **60**

Course Objectives:

Student will learn the finite differences, interpolating methods and numerical methods to solve differential equations.

Course Outcomes:

CO1: Describe Finite Differences and apply Newton's Formulae for Interpolation

CO2: Explain and apply Lagrange's and Newton divided difference formula for interpolation

CO3: Apply Gauss interpolation formulae, Stirling's and Bessel's formulae for interpolation

CO4: Apply numerical differentiation and numerical quadrature formulae.

Unit I: Finite Differences and Interpolation with Equal Intervals

Finite Differences: Introduction, Differences, Theorem, Factorial Notation, Factorial Function, The operator E, The operators D and ∇ Interpolation: Interpolation with equal intervals, Newton-Gregory Formula for forward interpolation, Newton-Gregory formula for Backward interpolation, Equidistant terms with one or more missing terms.

Unit II: Interpolation with Unequal Intervals

Introduction, Interpolation with unequal arguments, Divided differences with unequal arguments, Divided differences when two or more arguments are same or coincident, Properties of divided differences (Theorem 3 and Theorem 4 statement s only), Newton's formula for unequal intervals, Lagrange's interpolation formula for unequal intervals.

Unit III: Central Differences Interpolation Formulae

Introduction, Operators ∇, δ, σ and μ, Gauss's central difference formula, Stirling's formula, Bessel's formula.

Unit IV: Numerical Differentiation and Numerical Integration

Introduction, Approximate expressions for the derivative of a function, Introduction, A general quadrature formula for equidistant ordinates, Some important approximate quadrature formulae: The Trapezoidal rule, Simpson's one third rule, Simpson's three eighth rule, Weddle's rule.

Recommended Text Book:

H.C.Saxena: Finite Differences and Numerical Analysis, S.Chand & Co. New Delhi.Fourteenth Revised edition (1998).

Scope:

Unit-I: Chapter 1:1.1,1.2,1.3,1.5.1,1.5.3,1.6,1.6.1,1.6.2,1.7,1.8,1.8.1,1.8.2, 1.8.3.
Unit-II: Chapter 2:2.1,2.1.1,2.2 (Theorem 3 and Theorem 4 statements only),2.3,2.4.1
Unit-III: Chapter 3: 3.1, 3.2, 3.3, 3.4, 3.5
Unit-IV: Chapter 5:5.1,5.2,5.3
Chapter 6:6.1,6.2,6.3,6.3.1,6.3.2,6.3.3,6.3.4.

Reference Books:

1. S.S.Sastry: Introductory Methods of Numerical Analysis, Prentice-Hall of India Private Ltd.(Second Edition)1997.
2. E.V. Krishnamurthi & Sen: Numerical Algorithm,Affiliate East, West press Private Limited 1986.
3. M.K.Jain,SRK Iyengar,R.K.Jain:Numerical Methods for Scientific and Engineering Computations, New Age International Limited

Course Code: **MAT-403** Course Name: **Mechanics-II**

Credits:**03** Total Periods: **60**

Course Objectives:

Students will be able to find the velocity, acceleration, speed, angular momentum, field of force and motion under gravity.

Course Outcomes:

CO1: Find velocity and acceleration in terms of vector derivatives, curvature, Angular speed and angular velocity

CO2: Describe Radial and Transverse components of velocity and acceleration, areal speed and velocity

CO3: Explain Newton's Law of motion, angular momentum, work, energy, vector point function, Field of force.

CO4: Describe motion under gravity, projectile, Motion of projectile, Parabola of safety, motion in resisting medium, areal velocity of central orbit, Pedal's equation.

Unit-I: Kinematics and Dynamics of a Particle in two Dimensions

Introduction, Definitions, Velocity and acceleration in terms of vector derivatives, Tangent and unit vector along the tangent, Rate of change of unit vector moving in a plane, Curvature, principal normal, Tangential and normal components of velocity and acceleration, Angular speed and angular velocity, Radial and transverse components of velocity and acceleration, Areal speed and areal velocity.

Unit-II: Kinetics of a Particle

Introduction, Newton's law of motion, Matter, Linear momentum, Angular momentum, An Impulsive force and its impulse, Conservation of linear momentum, Impact of two bodies, Work, Energy, Scalar point function, Vector point function, Field of force, Conservative field of force.

Unit-III : Motion of a Projectile and Motion in a Resisting Medium

Rectilinear motion, Motion under gravity, Projectile, Motion of projectile, Range on an inclined plane, Parabola of safety, Projectile to pass through a given point, Motion in a resisting medium, Motion of a body moving under gravity and in a medium whose resistance varies as velocity.

Unit-IV: Central Orbits

Definitions, Areal velocity in central orbit, Differential equation of central orbit, Apses, Law of force, Pedal equation of some curves.

Recommended Text Book:

V.Tulsani, T.V.Warehekar, N.N.Saste: Mechanics and Differential Geometry Second Edition (1987) , S.Chand and Co.(Pvt.)Ltd., New Delhi.

Scope: Part-II : Dynamics of a Particle

Chapter (1): Complete

Chapter (2): Complete

Chapter (3): Complete

Chapter (4): Articles 4.01 to 4.10

Reference Books:

1. S.L.Loney: An Elementary Treatise on Statics, AITBS Publishers and Distributors, New Delhi.

2. B.R.Thakur, G.P.Shrivastava : Mechanics,Ram Prasad and Sons, Agra-3.

3. M.L.Khanna: Dynamics, Kedarnath Ramnath Prakashan, Meerut.

Course Code: **MAT- 404** Course Name: **Complex Analysis**

Credits**:03** Total Periods: **60**

Course Objectives:

To make students aware of generalization of real number system and calculus. This course improves mathematical skill and ability to solve various integration.

Course Outcomes:

CO1: Understand the concept of analytic function,Cauchy Riemann Equations

CO2: Understand the concept of harmonic functions

CO3: Understand the concept of complex integration and residues

CO4: Understand the concept of contour integration.

Unit-I:Complex Numbers

Complex numbers, Geometrical representation of imaginary numbers, Argand diagram, Modulus and argument, Exponential and circular functions of complex variables, Formulae of hyperbolic functions, De Moivre's theorem, Roots of a complex number.

Unit-II: Functions of Complex Variables

Introduction, Complex variable, Function of complex variable, Limits of complex variable, Continuity, Differentiability, Analytic functions, The Necessary and sufficient conditions for analytic functions, Cauchy Riemann equations in polar form, Orthogonal curves, Harmonic functions, Method to find a conjugate functions.

Unit-III: Complex Integration

Complex integration, Simply connected region, Cauchy's integral theorem, Cauchy's integral formulae, Morera's theorem, Cauchy's inequality, Liouville's theorem.

Unit-IV: Singularities and Residues

Singular point, Residues, Method of finding residues, Residue theorem, Evaluation of real definite integrals by contour integration, Integration round the unit circle.

Recommended Text book:

H.K.Dass: Advanced Engineering Mathematics, S.Chand and Co. Ltd, New Delhi (2004)

Scope:

Unit-I. Chapter 6: Article 6.1 to 6.4, 6.7 to 6.10

Unit-II. Chapter 7: Article 7.1 to 7.13

Unit-III. Chapter 7: Article 7.29 to 7.31, 7.33 to 7.37

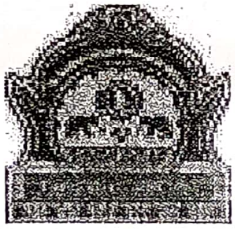
Unit-IV. Chapter 7: Article 7.41 to 7.46

Reference Books:

1. Shanti Narayan: Theory of Functions of Complex Variables, S.Chand and Company, New Delhi.
2. Complex Variables: Schaum's Outline Series.
3. S.K.Sharma and R.K.Sharma: Complex Analytic Functions: Theory and Applications, New Age International Publishers

(Dr. Bhausaheb R. Sontakke)
Chairman
Syllabus Committee.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.



Syllabus of B. A. /B. Sc. Third year (Mathematics) (Optional) With Effect from June – 2015

DR . BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
AURANGABAD
BOARD OF STUDIES IN MATHEMATICS
REVISED SYLLABUS FOR THIRD YEAR B.Sc. (MATHEMATICS)
(With Effect From June -2015)

Semester V

Compulsory Papers:

Paper – MAT 501: Real Analysis – I
Paper – MAT 502: Abstract Algebra – I

Optional Papers (Any One):

Paper – MAT 503: Mathematical Statistics – I
Paper – MAT 504: Ordinary Differential Equations – I
Paper – MAT 505: Programming in C – I

Semester VI

Compulsory Papers:

Paper – MAT 601: Real Analysis – II
Paper – MAT 602: Abstract Algebra – II

Optional Papers (Any One):

Paper – MAT 603: Mathematical Statistics – II
Paper – MAT 604: Ordinary Differential Equations – II
Paper – MAT 605: Programming in C – II

REVISED SYLLABUS FOR THIRD YEAR B.A. (MATHEMATICS)

(With Effect From June -2015)

Semester V

Main Papers:

Paper – MAT 501: Real Analysis – I
Paper – MAT 502: Abstract Algebra – I

Subsidiary Papers:

Paper – MAT 503: Mathematical Statistics – I
Paper – MAT 504: Ordinary Differential Equations – I

Semester VI

Main Papers:

Paper – MAT 601: Real Analysis – II
Paper – MAT 602: Abstract Algebra – II

Subsidiary Papers:

Paper – MAT 603: Mathematical Statistics – II
Paper – MAT 604: Ordinary Differential Equations – II

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 501: Real Analysis – I

Periods : 60
Marks : 50

1) Prerequisite:
Sets and elements, Operations on sets.

2) Functions:
Functions, Real-valued functions, Equivalence, Countability, Real numbers, Least upper bounds. [1]

3) Sequences of Real Numbers:
Definition of sequence and subsequence, Limit of a sequence, Convergent sequences, Divergent sequences, Bounded sequences, Monotone sequences, Operations on convergent sequences, Operations on divergent sequences, Limit superior and limit inferior, Cauchy sequences. [1]

4) Series of Real Numbers:
Convergence and divergence, Series with non-negative terms, Alternating series, Conditional convergence and convergence, Test for absolute convergence. [1]

5) Jacobians:
Definitions, Case of function of functions, Jacobian of implicit functions, Necessary and sufficient condition for a Jacobian to vanish. [2]

Recommended books:

1] R. R. Goldberg : ***Methods of Real Analysis*** : Oxford and IBH Publishing Co. Pvt. Ltd. NewDelhi.

Scope:

Chapter 1 : 1.3(A, B, C, D, E, F, G, H, I), 1.4(A, B, C, D, E), 1.5(A, B, C, D, E, F, G, H, I), 1.6(A, B, C, D, E), 1.7(A, B, C, D, E).

Chapter 2 : 2.1(A, B, C, D), 2.2(A, B), 2.3(A, B, C, D), 2.4(A, B, C), 2.5(A, B), 2.6(A, B, C, D, E), 2.7(A, B, C, D, E, F, G, H, I, J), 2.8(A, B, C, D), 2.9(A, B, C, D, E, F, G, I, J, K, L, M), 2.10(A, B, C, D, E), 2.12(A, B).

Chapter 3 : 3.1(A, B, C, D), 3.2(A, B, C, D, E), 3.3(A, B), 2.4(A, B, C), 3.6 (A, B, C, D, E, F, G, H, I,)

2] J. N. Sharma and A. R. Vashistha : ***Real Analysis*** : Krishna Prakashan Media (P), Ltd. Meerut.

Scope:

Chapter 13 : Articles 1, 2, 3, 4, 5, 6, 7

References:

1) D. Somasundaram and B. Choudhary : ***A first Course in Mathematical Analysis*** : Narosa Publishing House, New Delhi.
2) Hari Kishan : ***Real Analysis*** : Pragati Prakashan, Meerut.
3) S. K. Mittal and S. K. Pundir : ***Real Analysis*** : Pragati Prakashan, Meerut.

Note : Questions on prerequisite should not be asked.

B.Sc. (Third Year)(Mathematics)(Fifth Semester)
Paper – MAT 502: Abstract Algebra – I

Periods : 60
Marks : 50

1) Prerequisite:
Sets, Functions, Integers.

2) Group Theory:
Definition of a group, Some examples of groups, Some preliminary lemmas Subgroups, A counting Principle, Normal subgroups and quotient groups Homomrphism, Automorphism. [1]

3) Ring Theory:
Definition and examples of rings Some special classes of ring, Ideals and quotient rings More ideals and quotient rings, Polynomial ring. [1]

Recommended books:
1] I. N. Herstein : ***Topics in Algebra*** : Willey Eastern Pvt. Ltd., NewDelhi.

Scope:
Chapter 2 : 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7(Cauchy's Theorem for Abelian Groups and Cauchy's Theorem for Abelian Groups are without proof), 2.8.
Chapter 3 : 3.1, 3.2, 3.3, 3.5, 3.9(Omit Theorem 3.9.1)

References:
1) A. R. Vasishtha : ***Modern Algebra*** : Krishna Prakashan Media Pvt. Ltd. Meerut.
2) M. L. Khanna : ***Modern Algebra*** : Jai Prakash Nath and Co. Meerut.
3) Vijay K. Khanna and S. K. Bhambri : ***A course in Abstract Algebra*** : Vikas Publishing House Pvt.Ltd. New Delhi.
4) Surjeet Singh and Qazi Zameeruddin : ***Modern Algebra*** : Vikas Publishing House Pvt. Ltd. New Delhi.
5) Bhupendra Singh : ***Advanced Abstract Algebra*** : Pragati Prakashan Meerut.
6) Shanti Narayan and Sat Pal : ***A Text book of Modern Abstract Algebra*** : S. Chand and Co. Ltd. New Delhi.
7) I. N. Herstein : Abstract Algebra (Third Edition): Prentice-Hall, Upper Saddle River, New Jersey 07458.
8) Joseph A. Gallian : Contemporary Abstract Algebra (Seventh Edition) : Brooks/Cole 10 Davis Drive Belmont, CA 94002 – 3098 USA.
9) Goyal J. K. and K. P. Gupta : ***Advanced course in Abstract Algebra*** : Pragati Prakashan, Meerut.
10) J. N. Kapoor and K. R. Kalra : ***Modern Algebra*** **(Volume I and II)**: R. Chand and Co. New Delhi.
11) S. Nanda : ***Topics in Algebra***: Allied publishers Pvt. Ltd., New Delhi.

Note : Questions on prerequisite should not be asked.

Optional Papers (any ONE)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 503: Mathematical Statistics – I

Periods : 60
Marks : 50

1) Frequency Distribution and Measures of Central Tendency:
Frequency distribution, Continuous frequency distribution, Graphical representation of a frequency distribution, Histograms, Frequency Polygon, Measures of Central Tendency, Arithmetic mean, Properties of arithmetic mean, merits and demerits of Arithmetic mean, Weighted mean, Median, Merits and demerits of Median, Mode Merits and demerits of mode, Geometric mean, Merits and demerits of Geometric mean, Harmonic mean, partitions [1]

2) Measures of Dispersion Skewness and Kurtosis:
Dispersion, Characteristic for an ideal measure of dispersion, Measures of dispersion, Range, Quartile deviation, Mean deviation, Standard deviation and root mean square deviation, Relation between and s, Different formulae for calculating variance, Variance of the combined series, Coefficient of dispersion, Coefficient of variations, Moments, Relation between moments about mean in terms of moments about any point and vice versa, Effect of change of Origin and scale on moments, Pearson's and coefficients, Skewness and kurtosis. [1]

3) Theory of Probability:
Introduction, Definition of various terms, Mathematical or Classical Probability, Statistical Probability, Axiomatic approach to probability, Random experiments, Sample space, Events, Some illustrations, Algebra of events, Probability – Mathematical Notion, Probability function, Theorems on Probability of events, Law of addition of Probability, Multiplication law of probability and conditional probability, Independent events, Pairwise independent events, Conditions for mutual independence of n events. [1]

4) Random Variables and Distribution Functions:
Random Variable, Distribution function, Properties of distribution function, Discrete random variables, Probability mass function, Discrete distribution function, Continuous random variable, Probability density function, Various measures of Central tendency, Continuous distribution function. [1]

Recommended Book:
1] S. C. Gupta and V. K. Kapoor : ***Fundamentals of Mathematical Statistics*** (Nineth Edition) : Sultan Chand and Sons, New Delhi.

Scope:
Ch – 2: 2.1, 2.1.1, 2.2, 2.2.1, 2.2.2, 2.3, 2.4, 2.5, 2.5.1, 2.5.1, 2.5.2, 2.5.3, 2.6, 2.6.1, 2.7, 2.7.1, 2.8, 2.8.1, 2.9, 2.9.1, 2.11.
Ch – 3: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.7.1, 3.7.2, 3.7.3, 2.8, 2.8.1, 3.9, 3.9.1, 3.9.2, 3.10, 3.13, 3,14.
Ch – 4: 4.1, 4.3, 4.3.1, 4.3.2, 4.5, 4.5.1, 4.5.1, 4.5.2, 4.5.3, 4.5.4, 4.6, 4.6.1(omit Thm 4.1), 4.6.2, 4.7, 4.7.2, 4.7.3, 4.7.4, 4.7.5
Ch – 5: 5.1, 5.2, 5.2.1, 5.3, 5.3.1, 5.3.2, 5.4, 5.4.1, 5.4.2, 5.4.3

... 6

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 504: Ordinary Differential Equations – I

Periods : 60
Marks : 50

Prerequisite: Complex numbers

1) Preliminaries:
Introduction, Functions, Polynomials, Complex series and the exponential function, Determinants. [1]

2) Linear Equations of First Order:
Introduction, Differential Equations, Problems associated with differential equations, Linear equations of the first order, The equation $y' + ay = 0$, The equation $y' + ay = b(x)$, The general linear equation of the first order. [1]

3) Linear Equations with Constant Coefficients:
Introduction, The second order homogeneous equation, Initial value problems for second order equations, Linear dependence and independence, A formula for Wronskian, The non-homogeneous equation of order two. [1]

Recommended Book:

1] Earl A. Coddington : ***An Introduction to Ordinary Differential Equations*** : Prentice Hall of India Learning Private Limited, New Delhi-110001, (2009)

Scope:
Chapter 0. - Article 1, 3, 4, 5, 6
Chapter 1. - Article 1, 2, 3, 4, 5, 6, 7
Chapter 2. - Article 1, 2, 3, 4, 5, 6

Reference Books:

1) E.A.Coddington and Levinson Norman : ***Theory of Ordinary Differential Equations*** : McGraw Hill New York, (1955)
2) A.H.Siddiqi and P. Manchanda : ***A First Course in Differential Equations with Applications*** : Macmillan India Ltd., (2006)
3) D.G.Zill and M.R.Cullen : ***Advanced Engineering Mathematics*** (Second Edition) : Jones and Bartlett Publishers, (2000)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Paper – MAT 505: Programming in C – I

Periods : 45
Marks : 40

1) Overview of C :
Introduction, Importance of c, Sample C Programs, Basic structure of C programs, programming style, Executing a C program. [1]

2) Constants, Variables and Data Types :
Introduction, Character set, C tokens, Keywords and identifies, Constants, variables, Data types, Declaration of Variables, Storage class Assigning values to variables, Defining symbolic constants, case studies. [1]

3) Operators and Expressions:
Introduction, Arithmetic of operators , Relational operators, Logical operators, Assignment operators, Increment and decrement operators, Conditional operators, Bitwise operators, Special operators, Arithmetic expression, Evaluation of expressions, Precedence of arithmetic operators, Some computational problems, Type conversions in expression, Operators precedence and Associativity, mathematical functions. [1]

4) Managing Input and Output Operators:
Introduction, Reading a character, Writing a character, Formatted input, Formatted output. [1]

Recommended Book :

1] E. Balagurusamy : ***Programming in ANSI C*** (Fourth Edition) :Tata McGraw Hill

Scope:
Ch.1 :1.1,1.2, 1.3,1.4,1.5,1.6, 1.8 to 1.10
Ch.2 : 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9,2.10, 2.11
Ch.3 : 3.1 to 3.16
Ch.4 : 4.1 to 4.5

References:
1) Y.P. Kanetkar : ***Let us C*** : BPB Publication
2) Gottfried : ***Programming in C*** : Schaum's Series
3) Moolish Kooper : *Spirit of "C"*
4) D. Ravichandran : ***Programming in C*** : New-Age International Publisher
5) J.B.Dixit :***Mastering C Programs***
6) Pradip D Y and Manas Ghosh : ***Fundamentals of Computing and Programming in C***
7) V.Rajaraman : ***Computer Programming in C*** : PHI Pvt Ltd, New Delhi(2005)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)

Practical Paper – MAT-PR- 505(Based on MAT 505)

Periods : 15
Marks : 10

List of Experiments/Programs:

1. Program to find Maximum between two numbers using conditional operator.
2. Program to convert Temperature in Farad into Celsius. (C=0.5(F-32))
3. Program to find addition of two numbers.
4. Program to find square root of a number using *sqrt()* function.
5. Program to find m^n using *pow()* function.
6. Program to find simple interest (Si=(p+n+r)/100).
7. Program to find Area of Circle ($A=\pi r^2$)
8. Program to find Circumference of Rectangle (C= 2(length+breadth))
9. Program to find root of Quadratic Equation $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
10. Program to find Area of Rectangle (A = w x h)
11. Program to find circumference of circle
12. Program to find Area of Triangle. (A= ½ x b x h)
13. Program to find Area of Square (A = a2)
14. Program to find Area of Sphere (A = 4 π r2√)□
15. Program to Find Area of Cone (A= π r (r + 2+r2)

Note: University Practical Examination will be conducted annually.

B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Paper – MAT 601: Real Analysis – II

Periods : 60
Marks : 50

1) Limits in Metric Spaces:
Metric spaces, Limits in metric spaces. [1]

2) Continuous Functions on Metric Spaces:
Functions continuous on metric spaces, open sets, Closed sets. [1]

3) Connectedness, Completeness and Compactness:
More about open sets, connected sets, bounded sets and totally bounded sets, Complete metric spaces, Compact metric spaces, Continuous functions on compact metric spaces, Uniform continuity. [1]

4) Calculus:
Sets of measure zero, Definition of Riemann Integral, Existence of Riemann Integral, Fundamental Theorem of Calculus. [1]

5) Fourier Series:
Introduction. [2]

Recommended books:

1] R. R. Goldberg : ***Methods of Real Analysis*** : Oxford and IBH Publishing Co. Pvt. Ltd. NewDelhi.

Scope:

Chapter 4 : 4.2(A, B, C), 4.3(A, C, D).

Chapter 5 : 5.3(A, B, C, D, E, F, G, H), 5.4(A, B, C, D, E, F, G), 5.5(A, B, C, D, E, F, G, H, I, J, L, M).

Chapter 6 : 6.1(A, B), 6.2(A, B), 6.3(A, B, C, D, E), 6.4(A, B, C, D, E, F), 6.5 (A, B, C, D, E), 6.6(A, B, C, D), 6.8(A, B, C, D, E)

Chapter 7 : 7.1(A, B, C, D), 7.2(A, B, C, D, E, F, G), 7.3(Theorem and Lemma are without Proof), 7.4(A, B, C, D, E, F), 7.8(A, B, C, D, E, F, G)

2] D. Somasundaram and B. Choudhary : ***A first Course in Mathematical Analysis*** : Narosa Publishing House, New Delhi.

Scope:

Chapter 10 : Articles 10.1

References:

1) J. N. Sharma and A. R. Vashistha : ***Real Analysis*** : Krishna Prakashan Media (P), Ltd. Meerut.
2) Hari Kishan : ***Real Analysis*** : Pragati Prakashan, Meerut.
3) S. K. Mittal and S. K. Pundir : ***Real Analysis*** : Pragati Prakashan, Meerut.

... 16

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 602: Abstract Algebra – II

Periods : 60
Marks : 50

1) Vector Spaces and Modules:

Elementary basic concepts, Linear independence and bases, Dual Spaces, Inner product spaces, Modules. [1]

Recommended books:

1] I. N. Herstein : ***Topics in Algebra*** : Willey Eastern Pvt. Ltd., NewDelhi.

Scope:

Chapter 4 : 4.1, 4.2, 4.3, 4.4, 4.5

References:

1) A. R. Vasishtha : ***Modern Algebra*** : Krishna Prakashan Media Pvt. Ltd. Meerut.
2) M. L. Khanna : ***Modern Algebra*** : Jai Prakash Nath and Co. Meerut.
3) Vijay K. Khanna and S. K. Bhambri : ***A course in Abstract Algebra*** : Vikas Publishing House Pvt.Ltd. New Delhi.
4) Surjeet Singh and Qazi Zameeruddin : ***Modern Algebra*** : Vikas Publishing House Pvt. Ltd. New Delhi.
5) Bhupendra Singh : ***Advanced Abstract Algebra*** : Pragati Prakashan Meerut.
6) Shanti Narayan and Sat Pal : ***A Text book of Modern Abstract Algebra*** : S. Chand and Co. Ltd. New Delhi.
7) P. N. Chatterjjee : ***Linear Algebra*** : Prentice-Hall, Upper Saddle River, New Jersey 07458.
8) Joseph A. Gallian : ***Contemporary Abstract Algebra*** (Seventh Edition) : Brooks/Cole 10 Davis Drive Belmont, CA 94002 – 3098 USA.
9) Goyal J. K. and K. P. Gupta : ***Advanced course in Abstract Algebra*** : Pragati Prakashan, Meerut.
10) J. N. Kapoor and K. R. Kalra : ***Modern Algebra*** **(Volume I and II)**: R. Chand and Co. New Delhi.
11) S. Nanda : ***Topics in Algebra***: Allied publishers Pvt. Ltd., New Delhi.

Optional Papers (any ONE)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 603: Mathematical Statistics – II

Periods : 60
Marks : 50

1) Mathematical Expectation, Generating Functions:
Mathematical expectation, Expectation of a function of a random variable, Addition theorem of expectation, Multiplication theorem of expectation, Expectation of linear combination of random variables, Covariance, Correlation coefficient, Variance of a linear combination of random variables. [1]

2) Theoretical Discrete Probability Distributions:
Binomial distribution, moments, Recurrence relation for the moments of Binomial distribution, Moment generating function of Binomial distribution, Additive property of Binomial distribution, Cumulants of Binomial distribution, Recurrence relation for cumulants of Binomial distribution, Poission distribution, Moments of Poission distribution, Recurrence relation for moments of Poission distribution, Moment generating function of Poission distribution, cumulants of Poission distribution, Additive property of independent Poission variates, Geometric didtribution, Lack of memory, Moment of geometric distribution, Moment generating function of Geometric distribution. [1]

3) Theoretical Continuous Distributions:
Rectangular or Uniform distribution, Moments of rectangular distribution, Moment generating distribution of rectangular distribution, Normal distribution, Normal distribution as a limiting case of a binomial distribution, Mode of Normal distribution, Median of Normal distribution, moment generating function of Normal distribution, Cumulant generating function of Normal distribution, moments of Normal distribution, Gamma distribution, Moment generating function of Gamma distribution, Cumulant generating function of Gamma distribution, additive property of Gamma distribution, Exponential distribution, Moment generating function of exponential distribution. [1]

4) Correlation and Regression:
Bivariate distribution, Correlation, Scatter diagram, Karl Pearson's coefficient of correlation, limits for correlation coefficient, Assumptions underlying Karl Pearson's correlation, Regression, Lines of regression, regression curves, Properties of regression coefficients, Angle between two lines of regression. [1]

Recommended Book:
1] S. C. Gupta and V. K. Kapoor : ***Fundamentals of Mathematical Statistics*** (Ninth Edition) : Sultan Chand and Sons, New Delhi.

Scope:
Ch – 6: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.6.1, 6.7
Ch – 7: 7.2, 7.2.1, 7.2.2, 7.2.6, 7.2.7, 7.2.9, 7.2.10, 7.3, 7.3.2, 7.3.4, 7.3.5, 7.3.7, 7.3.8, 7.5, 7.5.1, 7.5.2, 7.5.2
Ch – 8: 8.1, 8.1.1, 8.1.2, 8.2, 8.2.1, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.6, 8.6.1
Ch – 10: 10.1, 10.2, 10.3, 10.3.1, 10.3.2, 10.7, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5

. . . . 12 . . .

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 604: Ordinary Differential Equations – II

Periods : 60
Marks : 50

1) Linear Equations with Variable Coefficients:
Introduction, Initial value problems for the homogeneous equation, Solution of homogeneous equation, The Wronskian and linear independence, Reduction of the order of a homogeneous equation, The nonhomogeneous equation, Homogeneous equation with analytic coefficients, The Legendre equation. [1]

2) Linear Equations with Regular Singular Points:
Introduction, The Euler equation, Second order equations with regular singular points- an example, Second order equations with regular singular points- the general case, The Bessel equation. [1]

Recommended Book:
1] Earl A. Coddington : ***An Introduction to Ordinary Differential Equations*** : Prentice India Learning Private Limited, New Delhi-110001, (2009)

Scope:

Chapter 3.- Article 1,2,3,4,5,6,7,8
Chapter 4.- Article 1,2, 3, 4, 7

Reference Books:

1) E. A. Coddington and Levinson Norman : ***Theory of Ordinary Differential Equations*** : McGraw Hill New York, (1955)
2) A.H.Siddiqi and P. Manchanda : ***A First Course in Differential Equations with Applications*** : Macmillan India Ltd., (2006)
3) D.G.Zill and M.R.Cullen : ***Advanced Engineering Mathematics*** (Second Edition) : Jones and Bartlett Publishers, (2000)

13

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Paper – MAT 605: Programming in C – II

Periods : 45
Marks : 40

1) Decision Making and Branching:
Introduction, Decision making with if statement, Simple if statement, The ifelse statement, Nesting of ifelse statement, The elseif ladder, The switch statement, The ?: Operator, The goto statement [1]

2) Decision Making and Looping:
Introduction, The while statement, The do statement, The for statement, Jumps in loops [1]

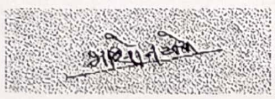
3) Arrays:
Introduction, One dimensional arrays, Declaration, Initialization, Two dimensional arrays, Initializing two-dimensional arrays, Multidimensional arrays. [1]

Recommended Book :
1] E. Balagurusamy : ***Programming in ANSI C*** (Second Edition) : Tata McGraw Hill

Scope:
Ch – 5 : 5.1 to 5.9
Ch – 6 : 6.1 to 6.5
Ch – 7 : 7.1 to 7.7

References:
1) Y.P. Kanetkar : ***Let us C*** : BPB Publication
2) Gottfried : ***Programming in C*** : Schaum's Series
3) Moolish Kooper : *Spirit of "C"*
4) D. Ravichandran : ***Programming in C*** : New-Age International Publisher
5) J.B.Dixit :***Mastering C Programs***
6) Pradip D Y and Manas Ghosh : ***Fundamentals of Computing and Programming in C***
7) V.Rajaraman : ***Computer Programming in C*** : PHI Pvt Ltd, New Delhi(2005)

Note: (i) There should be annual practical based on Paper : MAT 505 and MAT 605 of 20 Marks in Mar/Apr Practical Examination
(ii) There should be separate passing for Theory and Practical.



Dr. B. R. Sontakke
(Chairman, Board of Studies in Mathematics)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)

Practical Paper – MAT-PR 605(Based on MAT 605)

Periods : 15
Marks : 10

List o f Experiments/Programs:

1. Program to find minimum between two number using if.
2. Program to Calculate factorial of a number.
3. Program to check given number is prime or not.
4. Program to check given number is Armstrong or not. ($153 = 1^3+5^3+3^3$)
5. Program to find n terms of Fibonacci Series (1 1 2 3 5 8 13 21 .....)
6. Program to find n terms of the Series.

$$\sum_{n=1}^{\infty} \frac{1}{2^n} = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots.$$

7. Program to Sort any 10 Array Elements.
8. Program to Calculate Addition/Subtraction of two Matrices.
9. Program to calculate multiplication of two matrices.
10. Program to calculate Determinant of Matrix.
11. Program to Find Transpose of a Matrix.
12. Program to check given year is leap or not.
13. Program to find sum of series 1 to n.
14. Program to Calculate Grade of Student by inputting Percenta ge of the student.
15. Program to C heck given number is palindrome or not (ex. 12321)

Note: University Practical Examination will be conducted ann ually.

PRACTICAL QUESTION FORMAT

(MAT-PR-505 &605) (20 Marks) **Max.Time :Three Hours**

Q.1. Record Book **05 Marks.**

Q.2. Oral (Viva) **05 Marks.**

Q. 3. Write/Edit/Print a program in C **10 Marks.**
(Based on MAT-505& 605)

OR

Q. 4. Write /Edit/Print a program in C **10 Marks.**
(Based on MAT-505& 605)

Dr. Bhausaheb Sontakke
Chairman,
BOS in Mathematics

16