BENGALURU NORTH UNIVERSITY

DEPARTMENT OF COMMERCE
Tamaka, Sri Devraj Urs Extension, Kolar, 563103.

Chairman, BoS
Dr. M Muniraju
Professor, Department of Commerce, Bengaluru City University

Syllabus Framed as per the National Educational Policy – 2020
Academic Year - 2021-21

PROCEEDINGS OF UG BOS MEETING OF B.COM (HONS), B.COM(A&F) HONS, B.COM (BUSINESS ANALYTICS) HONS, B.COM (LOGISTICS AND SUPPLY CHAIN MANAGEMENT) HONS, BBA (TRAVEL AND TOURISM MANAGEMENT) HONS, BBA (TRAVEL AND HOSPITALITY MANAGEMENT) BBA (HOSPITAL AND HEALTH CARE MANAGEMENT) COURSES

Proceedings of BOS of-UG - B.Com (Hons), B.Com (A&F) Hons, B.Com (Business Analytics) Hons, B.Com (Logistics and Supply Chain Management) Hons, BBA (Travel and Tourism Management) Hons, BBA(Travel and Hospitality Management) BBA (Hospital and Health Care Management) courses for the academic year 2021-2022 meeting held on 12th, 16th and 22nd October 2021 at the Chamber of the Principal ,Government First Grade College, Hoskote at 10:00 AM under the Chairmanship of Prof. M. Muniraju. The Board has agreed and approved the Course Matrix and the Syllabus of first year for the above mentioned courses. In case of any input requirements, it shall be initiated by the Chairman and necessary modifications shall be done as approved by the Board.

MEMBERS PRESENT

1.	**Prof. M.Muniraju** Ex- Chairman and Dean, Department of Commerce, Bengaluru City University	**Chairman**
2.	**Prof. R. Sarvamangala,** Professor**,** Department of Commerce**,** Bangalore University	**External Member**
3.	**Dr.G.H. Nagaraj**, Principal, Government First Grade College, Harohalli	**External Member**
4.	**Dr. Chandrakantha K,** Professor and Dean, Faculty of Commerce**,** Bengaluru North University**,** LBS Government First Grade College, R.T Nagar	**External Member**
5.	**Dr. S. Muralidhar,** Associate Professor and Head, Department of Commerce, Government First Grade College, Kolar	**MEMBER**
6.	**Dr. Muninarayanappa,** Principal**,** Government First Grade College, Hosakote	**MEMBER**
7.	**Dr. Milind Dete ,**FCMA Director- Learning ISDC	**External Member**
8.	**Sri Gaurav Kapur,** Head of Policy ACCA,	**External Member**
9.	**Sri B.V. Murali Krishna,** Additional Commissioner Commercial Tax Department , GOK	**External Member**
10.	**Dr. Shailaja K,** Associate Professor**,** Department of Commerce **,** Government First Grade College for Boys, Kolar	**MEMBER**
11.	**Dr. Sairam A,** Assistant Professor**,** Department of Commerce **,** Government First Grade College,Vemagal	**MEMBER**

Co-Opted Members

1.	**Dr Gurumurthy**, Department of Commerce, Government First Grade College,Magadi	Co-Opted Member
2.	**Girish .B.N**, Assistant Professor, Department of Commerce, Government First Grade College, Fazer Town, Bengaluru	Co-Opted Member
3.	**Dr. Swaminath. S**, Department of Commerce, Government First Grade College, Kengeri, Bengaluru	Co-Opted Member
4.	**Narendra R S**, Department of Commerce, Government First Grade College, Kolar	Co-Opted Member

Minutes of the Meeting

1. Prof.M. Muniraju, Department of Commerce, Bengaluru City University, welcomed all the BOS Members of the B.Com and BBA Board for BOS meeting which was scheduled on 12t.10.2021, 16.10.2021 and 22.10.2021.

2. The Chairman of BOS highlighted the importance in implementing the salient features of National Education Policy in the UG curriculum and urged all the BOS members to adopt the innovative and goal oriented curriculum structure that would enable the students to have a successful career and become responsible citizens.

3. The BOS members presented their views on the inclusion of relevant subjects , contents ,modifications required for the existing subjects and also presented a wide list of skill based and value based subjects that are required to be included in the curriculum. All these modifications were extensively discussed and the curriculum structure was finalised with the consensus of all the members and was duly accepted by the Chairman.

4. Based on the recommendations of the members of the BOS the Chairman resolved and accepted the New Scheme of Teaching, Evaluation and Curriculum from the Academic year 2021-22 based on National Education Policy 2020 for four year B.Com and BBA Under Graduate Program.

Chairman - BOS

BENGALURU NORTH UNIVERSITY

**Scheme of Teaching, Evaluation & Curriculum
to be introduced from the**

Academic Year 2021-22

Based on

National Education Policy – 2020

for
Four Year Under-Graduate Program

Bachelor of Commerce (B.COM) - HONORS DEGREE
(CBCS -SEMESTER SCHEME)

A. **Regulations**
B. **Course Matrix**
C. **Curriculum of Courses**

Chairman, BoS

Dr. M Muniraju

Professor, Department of Commerce, Bengaluru City University

DEPARTMENT OF COMMERCE

Tamaka, Sri Devraj Urs Extension,
Kolar, 563103.

REGULATIONS PERTAINING TO B.COM – F&A DEGREE
ACCORDING TO NEP – 2020

I INTRODUCTION

The curriculum framework for B.Com. Degree is structured to offer a broad outline that helps in understanding the creative potential of new career growth opportunities based on changing industrial and societal needs. The course is upgraded keeping in mind the aspirations of students, with opportunities to major in specializations such as accounting, financial markets, marketing, human resources and banking to focus the students towards a career in those domains. The core concepts within subject have been updated to incorporate the recent advancements, techniques to upgrade the skills of learners to create a focus on various functional areas of business. Problem Based learning has been integrated into the curriculum for a better understanding of various concepts in business and commerce. The syllabus under NEP-2020 is expected to enhance the level of understanding among students and maintain the high standards of graduate program offered in the country. Effort has been made to integrate the use of recent technology and MOOCs to assist teaching learning process among students. The major objective of the graduate program is to elevate the subject knowledge among students, and making them as critical thinkers thereby students can address the issues related to industry and other business sectors.

II OBJECTIVES

1. To give an insight into the areas of Accounting, Finance, Taxation, Marketing, Human Resource Management and the new developments in business management.
2. To prepare students for professions in the field of Accounting and Finance and the latest developments relating to the Accounting & Finance
3. To incentivize the development of personal and executive skills in the students with the aim of enhancing the efficiency of decision making and strengthening the problem detection, analysis and solving skills
4. To enable students to understand and apply the latest developments in Information Technology to Accounting & Finance areas in order to develop core competencies for generate added value
5. To develop leaders who can head operations or logistics departments in the future in line with the latest developments in the field of Accounting & Finance
6. To develop global middle level managers to address and solve real time operational issues in the areas Accounting & Finance
7. To enable students to gain command over the new e-commerce business models
8. To develop committed managers with ethical standards and values
9. To develop business philosophers with a focus on social responsibility and ecological sustainability

III. GRADUATE ATTRIBUTES

The graduate attributes in B. Com. are the outline of the expected course learning outcomes mentioned in the beginning of each course. The characteristic attributes that a B. Com. graduate will be able to demonstrate through learning various courses which are listed below:

- **Disciplinary Knowledge**
  Capability of executing comprehensive knowledge and understanding of one or more disciplines that form part of commerce.

- **Communication Skills**
  Ability to communicate long standing, unsolved problems in commerce; Ability to show the importance of commerce as precursor to various market developments since the beginning of civilization.

- **Critical Thinking**
  - Ability to engage in reflective and independent thinking by understanding the concepts in every area of Commerce and Business;
  - Ability to examine the results and apply them to various problems appearing in different branches of Commerce and Business.

- **Problem solving**
  Capability to reduce a business problem and apply the classroom learning into practice to offer a solution for the same; Capabilities to analyse and synthesize data and derive inferences for valid conclusion; Able to comprehend solutions to sustain problems originating in the diverse management areas such as Finance, Marketing, Human Resource, Taxation and so on.

- **Research Related Skills**
  - Ability to search for, locate, extract, organize, evaluate, and use or present information that is relevant to a particular topic;
  - Ability to identify the developments in various branches of Commerce and Business.

- **Information and Communication Technology (ICT) digital literacy**
  Capability to use various ICT tools (like spreadsheet) for exploring, analysis, and utilizing the information for business purposes.

- **Self-directed Learning**
  Capability to work independently in diverse projects and ensure detailed study of various facets of Commerce and Business.

- **Moral and Ethical Awareness/Reasoning**
  Ability to ascertain unethical behavior, falsification, and manipulation of information; Ability to manage self and various social systems

- **Life-long learning**
  Capability of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Commerce.

IV. ELIGIBILITY FOR ADMISSION

Candidates who have completed two years Pre – University course of Karnataka State or its equivalent as notified by the university from time to time are eligible to seek admission for this course

V. DURATION OF THE PROGRAMME

The Duration of the Programme is Four (04) years of Eight Semesters. Progressive Certificate, Diploma, Bachelor Degree or Bachelor Degree with Honors provided at the end of each year of Exit of the Four years Undergraduate Programme respectively

Exit with	Credits Requirement*
Certificate at the Successful Completion of First Year (Two Semesters) of the Four Years Bachelor of Commerce Undergraduate Degree Programme	50
A Diploma at the Successful Completion of the Second Year (Four Semesters) of the Four Years Bachelor of Commerce Undergraduate Degree Programme	(50 + 50) 100
Basic Bachelor Degree at the Successful Completion of the Third Year (Six Semesters) of the Four Years Bachelor of Commerce Undergraduate Degree Programme	(50 + 50 + 44) 144
Bachelor Degree with Honours in a Discipline at the Successful Completion of the Four Years (Eight Semesters) of the Four Years Bachelor of Commerce Undergraduate Degree Programme	(50 + 50 + 44 + 41) 185

V. MEDIUM OF INSTRUCTION

The medium of instruction shall be English. However, a candidate is permitted to write the examination either in English or in Kannada (Kannada version Only for Theory Papers).

VI. ATTENDANCE

- For the purpose of calculating attendance, each semester shall be taken as a Unit.
- A student shall be considered to have satisfied the requirement of attendance for the semester, if he/she has attended not less than 75% in aggregate of the number of working periods in each of the courses compulsorily.
- A student who fails to satisfy the above condition shall not be permitted to take the University examination.

VII. TEACHING AND EVALUATION

M.Com graduates with B. Com, B.B.M, BBA & BBS as basic degrees from a recognized university are only eligible to teach and to evaluate the Courses (except languages, compulsory additional subjects and core Information Technology related subjects) mentioned in this regulation. Languages and additional courses shall be taught by the graduates as recognized by the respective Board of Studies.

VIII. RECORD MAINTENANCE AND SUBMISSION

- Every college is required to establish an Innovative business lab / computer lab to enable students to get practical knowledge of business activities and online learning.
- In every semester, the student should keep a record of the Business Lab/Field Study Activity and submit it to the concerned faculty.
- The BOE is authorized to make random surprise visits to the colleges and verify record-books and the internal marks awarded.

IX. Guidelines for Continuous Internal Evaluation (CIE) and Semester End Examination (SEE)

The CIE and SEE will carry 40% and 60% weightage each, to enable the course to be evaluated for a total of 100

marks, irrespective of its credits. The evaluation system of the course is comprehensive & continuous during the entire period of the Semester. For a course, the CIE and SEE evaluation will be on the following parameters:

SL No.	Parameters for the Evaluation	Marks
	Continuous Internal Evaluation (CIE)	
A	Continuous & Comprehensive Evaluation (CCE)	20 Marks
B	Internal Assessment Tests (IAT)	20 Marks
	Total of CIE (A+B)	**40 Marks**
C	Semester End Examination (SEE)	**60 Marks**
	Total of CIE and SEE (A + B + C)	**100 Marks**

A. Continuous & Comprehensive Evaluation (CCE): The CCE will carry a maximum of 20% weightage (20 marks) of total marks of a course. The faculty member can select any four of the following assessment methods, Minimum of four of the following assessment methods of (5) marks each:

- Individual Assignments
- Seminars/Classroom Presentations/ Quizzes
- Group Discussions /Class Discussion/ Group Assignments
- Case studies/Case lets
- Participatory & Industry-Integrated Learning/ Field visits
- Practical activities / Problem Solving Exercises
- Participation in Seminars/ Academic Events/Symposia, etc.
- Mini Projects/Capstone Projects
- Any other academic activity.

B. Internal Assessment Tests (IAT): The IAT will carry a maximum of 20% weightage (20 marks) of total marks of a course, under this component, two tests will have to be conducted in a semester for 20 marks each and the same is to be scaled down to 10 marks each.

C. In the case of 50 percent of CIE weightage courses, faculty members can choose assessment methods accordingly for the required marks as mentioned above.

Internal Assessment Test Bachelor of Commerce (B.Com.)

Name of the Course: **Course Code:**
Duration: 1 Hours   **Total Marks: 20**

SECTION-A

I.   **Answer any two of the following questions.**
        (Questions related to Concepts) (2X 2 = 4)

1.
2.
3.

SECTION-B

II.   **Answer any two of the following questions.**
        (Questions are related to Understanding and Application) (2X 4 = 8)

4.
5.
6.

SECTION- C

III.   **Answer any one of the following questions.**
        (Questions are related to analysis and evaluation) (1 X 8 = 8)

7.
8.

XXXXXXXX

X. APPEARANCE FOR THE EXAMINATION

A candidate shall be considered to have appeared for the examination only if he/she has submitted the prescribed application for the examination along with the required fees to the university.

XI. PATTERN OF QUESTION PAPER

SECTION-A 1. a,b,c,d,e,f, g	(Conceptual questions) Answer any FIVE out of seven sub questions	(05 X 02 = 10 Marks)
SECTION -B: 2,3,4,5.6	(Application questions) Answer any THREE out of five questions	(03 X 04 = 12 Marks)
SECTION-C: 7,8,9.10, 11	(Analysis and understanding questions) Answer any THREE out of five questions	(03 X 10 = 30 Marks)
SECTION-D 12	Question completely based on the skill Development part (lab activities) Answer any ONE out of two questions	(01 X 8 = 8 Marks)
TOTAL		**60 Marks**

Notes:

- One Hour of Lecture is equal to 1 Credit.
- One Hour of Tutorial is equal to 1 Credit (Except Languages).
- Two Hours of Practical is equal to 1 Credit

Acronyms Expanded	
AECC	- Ability Enhancement Compulsory Course
DSC ©	- Discipline Specific Core (Course)
SEC-SB/VB	- Skill Enhancement Course-Skill Based/Value Based
OEC	- Open Elective Course
DSE	- Discipline Specific Elective
SEE	- Semester End Examination
CIE	- Continuous Internal Evaluation
L+T+P	- Lecture + Tutorial + Practical(s)

Semester I								
Sl. No.	**Course Code**	**Title of the Course**	**Category of Courses**	**Teaching Hrs per Week (L + T + P)**	**SEE**	**CIE**	**Total Marks**	**Credit**
1	Lang.1.1	Language-I	AECC	3+1+0	60	40	100	3
2	Lang.1.2	Language–II	AECC	3+1+0	60	40	100	3
3	B.Com.1.1	Financial Accounting	DSC	4+0+0	60	40	100	4
4	B.Com.1.2	Management Principles and Applications	DSC	4+0+0	60	40	100	4
5	B.Com.1.3	Principles of Marketing	DSC	4+0+0	60	40	100	4
6	B.Com.1.4	Digital Fluency	SEC-SB	1+0+2	50	50	100	2
7	B.Com.1.5	Physical Education - Yoga	SEC-VB	0 + 0 + 2	-	25	25	1
8	B.Com1.6	Health & Wellness	SEC-VB	0 + 0 + 2	-	25	25	1
9	B.Com.1.7	*Any one of the following* a. Accounting for everyone b. Financial Literacy c. Entrepreneurship & Start-ups (Refer Annexure)	OEC	3+0+0	50	50	100	3
Sub–Total(A)					**400**	**350**	**750**	**25**

SECOND SEMESTER

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hrs per Week (L+T+ P)	SEE	CIE	Total Marks	Credits
		Semester II						
1	Lang.2.1	Language-I	AECC	3+1+0	60	40	100	3
2	Lang.2.2	Language–II	AECC	3+1+0	60	40	100	3
3	B.Com.2.1	Advanced Financial Accounting	DSC	4+0+0	60	40	100	4
4	B.Com.2.2	Corporate Administration or Business Mathematics	DSC	4+0+0	60	40	100	4
5	B.Com.2.3	Law & Practice of Banking	DSC	3+1+0	60	40	100	4
6	B.Com.2.4	Environmental Studies	AECC	2+0+0	50	50	100	2
8	B.Com.2.5	Sports	SEC – VB	0+0+2		25	25	1
9	B.Com.2.6	NCC/NSS/R&R(S&G)/Cultural	SEC-VB	0+0+2		25	25	1
7	B.Com 2.7	***Any one of the following*** a. Financial Environment b. Investing in Stock Markets c. Event Management (Refer Annexure)	OEC	3+0+0	50	50	100	3
		Sub–Total(B)			400	350	750	25

Name of the Program: Bachelor of Commerce (B.Com.)
Course Code: B.Com. 1.1
Name of the Course: FINANCIAL ACCOUNTING

Course Credits	No. of Hours per week	Total No. of Teaching Hours
4 Credits	4 Hrs	56 Hrs

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies, Lab & field work etc.

Course Outcomes:
On successful completion of the course, the student will be able to acquire Conceptual knowledge of the financial accounts and to impart skills for recording various kinds of **Business** transactions.

Syllabus

Module:1 - THEORETICAL FRAMEWORK OF FINANCIAL ACCOUNTING   **10 Hrs**
Introduction; Meaning and Definition; Significance of Accounting; Functions of Accounting; Users of Accounting Information; Accounting Principles; Accounting Concepts and Conventions; Accounting equations - Problems on Accounting Equation; Accounting Standards - List of Indian Accounting Standards

Module:2 - HIRE PURCHASE ACCOUNTING   **16 Hrs**
Meaning of Hire Purchase and Installment Purchase System; Hire Purchase v/s sale; Differences between Hire Purchase and Installment system; Meaning of technical terms – Hire Purchase Agreement – Hire Purchase Price – Cash Price – Hire Purchase Charges – Net Hire Purchase Price – Net Cash Price; Calculation of Interest; Calculation of Cash Price; Journal Entries and Ledger Accounts in the books of Hire Purchaser and Hire Vendor (Asset Accrual Method only and excluding repossession)

Module: 3 - DEPARTMENTAL ACCOUNTS   **16 Hrs**
Meaning, Objectives, basis of apportionment of common expenses among different departments; Preparation of Trading and Profit and Loss Account in Columnar form; Preparation of Balance Sheet in horizontal format – (Including Inter Departmental Transfers at cost price only).

Module: 4 - BRANCH ACCOUNTS   **14 Hrs**
Introduction, Meaning, Objectives, Types of Branches; Dependent Branches – Features; Supply of Goods at Cost Price; Invoice Price; Branch Account in the books of Head Office (Debtors System Only)

Skill Developments Activities:
- List out any five accounting standards with formats
- Collection and recording of Hire Purchase Agreement.
- Collection & recording of financial data of Departmental store
- Collection of transactions relating to any branch and preparation of branch account
- Preparation of Departmental Profit & Loss Account and Balance Sheet with Imaginary Figures.
- Calculation of interest under different situations of Hire Purchase System.
- Any other activities, which are relevant to the course

BOOKS FOR REFERENCE:
1. Arulanandam & Raman – Financial Accounting – I, HPH
2. Dr. S Muralidhar, Prof. S A Jagadeesha, Dr. K S Sailaja & Prof. P R Narasappa– Financial Accounting- Kalyani Publishers
3. Anil Kumar, Rajesh Kumar and Mariyappa - Financial Accounting - HPH

4. Prof. Jayaram, Dr. Sairam A, Dr. Vikram K, Dr. Yathiraju K - Advanced Financial Accounting – Phoenix Publishing House
5. Jawaharlal & Seema Srivastava - Financial Accounting - HPH
6. Dr. S.N. Maheswari - Financial Accounting - Vikas Publications
7. S P Jain and K. L. Narang - Financial Accounting- I - Kalyani Publishers
8. Radhaswamy and R.L. Gupta - Advanced Accounting - Sultan Chand
9. Dr. Janardhanan - Financial Accounting - Kalyani Publishers
10. Guruprasad Murthy - Financial Accounting - HPH
11. Soundarrajan & K. Venkataramana - Financial Accounting - SHBP
12. Dr.Venkataraman & others (7 lecturers) - Financial Accounting - VBH

Name of the Course: MANAGEMENT PRINCIPLES AND APPLICATIONS

Course Credits	No. of Hours per week	Total No. of Teaching Hours
4 Credits	4 Hrs	**56 Hrs**

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies, Lab & field work etc.

Course Outcomes:
On successful completion of the course, the students will be able to understand the principles of management of a business entity and life skills needed for effective management and navigate their lives.

Syllabus

Module: 1- INTRODUCTION TO MANAGEMENT   10 Hrs
Introduction, Meaning, Definitions, Characteristics, Importance and Scope of Management; Management - as a Science, as an Art and as a Profession; Meaning and Definitions of Administration; Differences between Management and Administration; Emerging issues in Management; Outsourcing; Virtual Organizations; TQM; Talent Management

Module: 2 - PRINCIPLES AND FUNCTIONS OF MANAGEMENT   14 hrs
Principles of Management -Nature and Importance, F.W Taylor's Scientific Management; Henry Fayol's 14 Principles of Management; Management By Objectives (MBO) - Meaning, Definition, Need, Benefits and Limitations; Management By Exception (MBE) - Meaning, Definition, Need, Benefits and Limitations; Management functions- Planning, Organizing, Staffing, Directing, Coordinating, Communication & Controlling (Nature, Meaning, Definitions, Characteristics); Benefits & Limitations of Planning; Types of Plans.

Module: 3 - ORGANISING, STAFFING AND COORDINATION   14 Hrs
Organizing - Introduction, Meaning, Concept and Process; An overview of Span of management - Line, Line & Staff, Functional and Matrix Organization; Decentralization; Delegation of authority; Formal and Informal Structure; Principles of Organizing;

Staffing – Introduction, Meaning, Nature, Importance, Staffing Process

Coordination – Introduction, Concept, Principles of Coordination.

Module: 4 - LEADERSHIP, MOTIVATION & CONTROLLING   18 Hrs
Leadership - Meaning, Definition, Characteristics; Role and Qualities of a good Leader; Leadership Styles—Autocratic, Democratic, Free-rein; New-age leadership styles - servant leadership, level-5 leadership, transformation leadership, transactional leadership, negotiation leadership, moral leadership, women leadership and global business leadership style
Motivation- Nature, importance; Theories of Motivation– Maslow's Need Hierarchy Theory, McGregor's Theory, X and Theory Y and Herzberg's Two Factory Theory
Controlling: Concept, Process, Limitations; Principles of Effective Control; Major Techniques of control - Ratio Analysis, ROI, Budgetary Control, EVA, PERT/CPM (Basic Concepts & Theory only)

Skill Developments Activities:
1. Collect the photographs and bio-data of any three leading contributors of management thoughts.
2. Visit any business Organization and collect the information on types of planning adopted by them.

3. Develop E-content for application of Maslow's need hierarchy theory in the context of Indian population
4. Analyze the staffing process of any select five companies of different sectors.
5. Visit any manufacturing firm and identify the controlling system followed.
6. Any other activities, which are relevant to the course

BOOKS FOR REFERENCE:
1. Koontz & O'Donnell - Management- McGraw-Hill
2. L M Prasad - Principles of management- Sultan Chand & Sons
3. Rustum & Davar - Principles and practice of Management - Vikas Publishing House
4. Sharma &Shashi K Guptha – Principles of Management - Kalyani Publishing House
5. C. B Gupta-Business Management- Sultan Chand & Sons
6. Dr.S.Muralidhar and et.al - Management Principles and Practice- Kalyani Publishers
7. K Ramachandra and et.al. - Principles of Management - HPH
8. Williams Tripathy- Management- Cengage Publishers

Name of the Program: Bachelor of Commerce (B.Com.)
Course Code: B.Com. 1.3
Name of the Course: PRINCIPLES OF MARKETING

Course Credits	No. of Hours per week	Total No. of Teaching Hours
4 Credits	4 Hrs	56 Hrs

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies, Lab & field work etc.,

Course Outcomes:
 On successful completion of the course, the students will be able familiarize with the concepts, dimensions and trends in modern marketing practices

Syllabus

Module: 1 - INTRODUCTION TO MARKETING   16 Hrs.
Marketing - Meaning, Definition, Goals & Concepts; Approaches to Marketing; Selling vs Marketing; Functions of Marketing; Marketing Management – Meaning& importance; Marketing Environment - concept, importance, Micro & Macro Environment

Module: 2 - CONSUMER BEHAVIOUR & MARKET SEGMENTATION   12 Hrs
Consumer Behavior - Nature and Importance; Consumer buying decision process; Factors influencing consumer buying behavior
Market segmentation - Concept, importance and bases; Target market selection; Positioning concept - Importance and bases; Product differentiation v/s market segmentation

Module: 3 - MARKETING MIX   20 Hrs.
Marketing Mix - Meaning and Elements
Product, Product Mix, Product Line, Product Life Cycle, Product Planning, New Product Development, Branding, Packing and Packaging
Pricing – Factors Influencing Pricing, Methods of Pricing (meanings) and Pricing Policy
Physical Distribution – Meaning, Factors affecting Channels of distribution, Types of Marketing Channels
Promotion – Meaning and Significance of Promotion, Personal Selling, Sales Promotion, Publicity, Public Relations, Advertising; Advertising Media; Advertising Budget; Bases for Advertising Budget.

Module: 4 - RECENT DEVELOPMENTS IN MARKETING   08 Hrs
Social Marketing; online marketing; direct marketing; services marketing; green marketing; Rural marketing; Consumerism; Search Engine Marketing; Mobile Marketing; Marketing Analytics; Social Media Marketing; Email Marketing; Live Video Streaming Marketing; Network Marketing

Skill Developments Activities:
1. Suggest strategies for development of a new product
2. Study of Consumer Behavior for a product of your choice
3. Develop an Advertisement copy for a product
4. Prepare a chart for distribution network for different products
5. SWOC (Strengths, Weakness, Opportunities & Challenges) – of Digital Marketing
6. Structure of Point-of-sale System, E-Way Bill, Fast Tag & Wireless Swiping Machines

BOOKS FOR REFERENCE:

1. Philip Kotler - Marketing Management- PHI
2. Sontakki - Marketing Management - Kalyani Publishers
3. Davar - Marketing Management - Vikas Publishing House
4. Dr.S.Muralidhar and et.al - Modern Marketing- Kalyani Publishers
5. Rekha. M.P. &Vibha V – Marketing & Services Mgt – VBH
6. Sunil B. Rao - Marketing & Services Mgt – HPH
7. Janardhan T.G., Leelavathy AM, Bhagya G.B – Marketing & Service Management - Kalyani Publishers
8. Dr. Alice Mani - Marketing & Services Management - SBH
9. J.C. Gandhi - Marketing Management - TMH
10. Stanton W.J, Michael & Walker - Fundamentals of Management - TMH
11. Jayachandran - Marketing Management - Excel Books
12. K. Venkatramana - Marketing Management – SHBP
13. P N Reddy & Appanniah - Essentials of Marketing Management – HPH
14. K. Karunakaran - Marketing Management - HPH
15. Ramesh and Jayanthi Prasad - Marketing Management - I.K. International Publishers
16. Lamb & Hair- Marketing- Cengage Publishers

Name of the Program: Bachelor of Commerce (B.Com.)
Course Code: B.Com. 2.1
Name of the Course: ADVANCED FINANCIAL ACCOUNTING

Course Credits	No. of Hours per week	Total No. of Teaching Hours
4 Credits	4 Hrs	56 Hrs

<table>
<tr><td colspan="3" align="center">Pedagogy:</td></tr>
<tr><td colspan="3">Classroom lecture, Case studies, Group discussion, Seminar & field work etc.,</td></tr>
<tr><td colspan="3" align="center">Course Outcomes:</td></tr>
<tr><td colspan="3">On successful completion of the course, the students will be able to familiar with the accounting procedures for different types of businesses and to impart skills for recording various kinds of business transactions</td></tr>
<tr><td colspan="3" align="center">Syllabus:</td></tr>
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Module: 1 - CONSIGNMENT ACCOUNTS   **14 Hrs**

Consignment - Introduction & Meaning; Consignor & Consignee; Goods Invoiced at Cost Price; Goods Invoiced at Selling Price; Normal Loss & Abnormal Loss; Valuation of Stock; Stock Reserve; Journal Entries & Ledger Accounts in the books of Consignor and Consignee

Module: 2 - ACCOUNTING FOR JOINT VENTURES   **14 Hrs**

Joint Venture – Introduction, Meaning & Objectives; Distinction between Joint Venture and Consignment; Distinction between Joint Venture and Partnership; Maintenance of Accounts in the books of co-ventures; Maintaining Separate Books for Joint Venture; Preparation of Memorandum Joint Venture – Problems

Module: 3 - ROYALTY ACCOUNTS   **14 Hrs**

Royalty - Meaning and definition; Technical Terms – Royalty, Royalty Agreement, Landlord, Minimum Rent, Short Workings, Recoupment of Short Working under restrictive (Fixed Period) and non-restrictive (Floating Period), Recoupment within the Life of the Lease; Accounting Treatment for Strike and Stoppage of work; Accounting Treatment in the books of Lessee and lessor – Journal entries and Ledger Accounts with minimum rent account

Module: 4 - CONVERSION OF PARTNERSHIP FIRM INTO A LIMITED COMPAN   **14 Hrs**

Meaning & Objectives of Conversion; Purchase Consideration - Methods of Calculation of Purchase Consideration - Lump Sum Method- Net Assets Method - Net Payment Method; Mode of Discharge of Purchase Consideration; Ledger Accounts in the Books of Vendor; Incorporation Entries in the Books of Purchasing Company; Preparation of Balance Sheet in Vertical form.

Skill Development Activities:
1. Preparation of Consignment account with imaginary figures
2. List the types of business which comes under consignment
3. Preparation of Joint Venture Agreement
4. Collection & recording of Royalty agreement with regard to any suitable situation
5. Preparation of list of items which comes under Royalty accounts

BOOKS FOR REFERENCE
1. Arulanandam & Raman - Advanced Accountancy - HPH
2. Dr.S.Muralidhar, Prof. S A Jagadeesha, Dr. K S Sailaja & Prof. P R Narasappa– Advanced Financial Accounting- Kalyani Publishers
3. Anil Kumar, Rajesh Kumar and Mariyappa - Advanced Financial Accounting - HPH
4. Dr. Alice Mani - Advanced Financial Accenting - SBH
5. Dr. S.N. Maheswari - Financial Accounting - Vikas Publication
6. S P Jain and K. L. Narang - Financial Accounting - Kalyani Publication
7. Souandrajan & K. Venkataramana - Financial Accounting - SHBP
8. Dr.Janardhanan - Advanced Financial Accounting - Kalyani Publishers
9. Radhaswamy and R.L. Gupta - Advanced Accounting - Sultan Chand
10. M.C. Shukla and Grewel - Advanced Accounting

Name of the Program: Bachelor of Commerce (B.Com.)
Course Code: B.Com. 2.2(a)
Name of the Course: CORPORATE ADMINISTRATION

Course Credits	No. of Hours per week	Total No. of Teaching Hours
4 Credits	4 Hrs	56 Hrs

Pedagogy:
Classroom lecture, Case studies, Group discussion, Seminar & field work

Course Outcomes:
On successful completion of the course, enable the students to get familiarized with the existing Corporate Law and Governance

Syllabus:

Module:1 - INTRODUCTION TO COMPANY	**12 hrs**

Company – Introduction, Meaning, Definition, Features; Companies Act 1956 as repealed by Companies Actb2013; Kinds of Companies – One Person Company, Private Company, Public Company, Company limited by Guarantee, Company limited by Shares, Holding Company, Subsidiary Company, Government Company, Associate Company, Small Company, Foreign Company, Global Company, Body Corporate, Listed Company

Module: 2 - FORMATION OF COMPANY	**16 hrs**

Introduction to Formation of Company

Promotion Stage; Meaning of Promoter, Position of Promoter & Functions of Promoter

Incorporation Stage; Meaning & contents of Memorandum of Association & Articles of Association; Distinction between Memorandum of Association and Articles of Association; Certificate of Incorporation

Subscription Stage – Meaning & contents of Prospectus; Statement in lieu of Prospects; Issue, allotment & Forfeiture of shares; Book Building Process,

Commencement Stage – Document to be filed; e-filing; Registrar of Companies; Certificate of Commencement of Business

Module: 3 - CORPORATE GOVERNANCE	18 **hrs**

Key Managerial Personnel – Managing Director, Whole time Directors, Chief Financial Officer, Resident Director, Independent Director; Auditors – Appointment, Powers - Duties & Responsibilities; Audit Committee & CSR Committee; Company Secretary - Meaning, Types, Qualification, Appointment, Position, Rights, Duties, Liabilities & Removal or dismissal.

Corporate Meetings – Introduction, Importance, types, Resolutions, Minutes of meeting; Requisites of a valid meeting – Notice, Quorum, Proxies, Voting; Registration of resolutions; Role of a company secretary in convening the meetings.

Internal Audit for Governance – nature, scope, function, planning process, investigation of fraud, internal audit reports; Statutory Audit for Governance

An introduction to e-governance and XBRL.

Module: 4 - WINDING-UP OF COMPANIES	10 **hrs**

Winding-up - Introduction & Meaning, Modes of Winding up; Consequence of Winding up; Official Liquidator – Role & Responsibilities of Liquidator; Defunct Company; Insolvency Code; Administration of NCLT, CLAT & Special Courts

Skill Development Activities:

1. Drafting of Memorandum of Association, Drafting Articles of Association.
2. Drafting Notice of Company Meetings – Annual, Special, Extraordinary and Board meetings.
3. Drafting Resolutions of various meetings – different types.
4. Chart showing different types of Companies.
5. Collecting & recording the practice of corporate governance in India

BOOKS FOR REFERENCE

1. S.N Maheshwari - Elements of Corporate Law - HPH.
2. Balchandran – Business Law for Management - HPH

3. Dr. B.G. Bhaskar, K.R. Mahesh Kumar – Corporate Administration - VBH
4. .Dr. P.N. Reddy and H.R. Appanaiah - Essentials of Company Law and Secretarial Practice - HPH
5. M.C. Shukla & Gulshan - Principles of Company Law
6. K. Venkataramana - Corporate Administration - SHBP
7. N.D. Kapoor - Company Law and Secretarial Practice - Sultan Chand
8. C.L Bansal - Business and Corporate Law
9. M.C. Bhandari - Guide to Company Law Procedures - Wadhwa Publication
10. S.C. Kuchal - Company Law and Secretarial Practice
11. S.C. Sharma - Business Law - I.K. International Publishers
12. S.N Maheshwari - Elements of Corporate Law - Vikas Publishers
13. Dr. Avtar Singh - Company Law
14. Gower & Davies – The Principles of Modern Company Law

Course Credits	No. of Hours per week	Total No. of Teaching Hours
4 Credits	4 Hrs	56 Hrs

Pedagogy:
Classroom lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcome:
On successful completion of the course, the students will be familiarized with various applications of mathematical techniques towards solving business problems and develop reasoning ability.

Syllabus:

Module: 1 - NUMBERSYSTEM AND SET THEORY   **12Hrs**

Number System: Introduction, Natural Numbers, Integers, Prime Numbers, Rational and Irrational numbers, Real Numbers, HCF and LCM (Simple problems)

Set Theory: Theory of Sets – Set Theory- Venn diagram

Module: 2 - TYPES OF EQUATIONS AND MATRICES   **18 Hrs**

Equations: Linear equations, Simultaneous equations (only two variables), Elimination and substitution methods only, Quadratic equations - Factorization and formula methods ($ax^2 + bx + c = 0$ form only); Application of equations in business and management.

Matrices: Algebra of Matrices, Inverse of a Matrix, Problems on linear equations in two variables using Cramer's rule. Application of Matrices in Business

Module: 3 - PROGRESSIONS   **10 Hrs**

Arithmetic Progression, Finding the 'nth 'term of AP & Sum to nth term of AP; Geometric Progression – Finding the 'nth 'term of GP and sum to 'nth 'term of GP

Module: 4 - COMMERCIAL ARITHMETIC AND LOGICAL REASONING   **16 hrs**

Interest: Simple Interest, Compound Interest including yearly and half yearly calculations, Annuities, Percentages, Bills Discounting, Ratios and proportions, duplicate-triplicate and sub-duplicate of a ratio.

Proportions: Third, fourth and inverse proportion- problems.

Logical Reasoning: Number Series, Coding and Decoding and Odd man out; Direction Tests, Seating Arrangements; Blood Relations, Syllogism

SKILL DEVELOPMENT ACTIVITIES:
1. Draft a chart on number system and its application
2. Show a chart for different kinds of equations
3. Application of Matrix in Business Problems
4. Develop an example on application of progression in real life situation
5. Draft the procedure of discounting of bills by commercial banks
6. Take the previous UPSC, KPSC, Banks, Insurance company, Railway board question papers and solve numerical aptitude and reasoning segments
7. .Learning Mathematical applications and decision-making using MS-Excel Functions

BOOKS FOR REFERENCE
1. Albright - Business Analytics - Cengage
2. R.G.Saha – Methods and Techniques for Business Decisions - VBH
3. Dr. Sancheti and Kapoor - Business Mathematics and Statistics - Sultan Chand
4. Zamarudeen - Business Mathematics Vikas
5. R.SBhardwaj - Mathematics for Economics and Business
6. Anderson & Sweeny - Essentials of Business Analytics - Cengage
7. Madappa, Mahadi Hassan, M .Iqbal Taiyab –Business Mathematics - Subhash
8. G.R.Veenaand Seema - Business Mathematics and Statistics - I. K. International Publishers
9. Rajesh S Rajaghatta - Methods and Techniques for Business Decisions - Kalyani Publishers

Name of the Program: Bachelor of Commerce (B.Com.)
Course Code: B.Com. 2.3
Name of the Course: LAW & PRACTICE OF BANKING

Course Credits	No. of Hours per week	Total No. of Teaching Hours
4 Credits	4 Hrs	56 Hrs

Pedagogy:

Classroom lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes:

On successful completion of the course, the students shall be able to
- a. Summarize the relationship between Banker & customer and different types of functions of banker.
- b. Analyze the role, functions and duties of paying and collecting banker.
- c. Make use of the procedure involved in opening and operating different accounts.
- d. Examine the different types of negotiable instrument & their relevance in the present context.
- e. Estimate possible developments in the banking sector in the upcoming days

Syllabus

Module: 1 - INTRODUCTION TO BANKING **20 Hrs**

Introduction- Meaning – Need – Importance – Primary, Secondary & Modern functions of banks - Origin of banking- Banker and Customer Relationship (General and special relationship) - Origin and growth of commercial banks in India – Types of Banks in India– Banks' Lending - changing role of commercial banks. RBI: History-Role & Functions.
Paying banker: Introduction - Meaning – Role – Functions - Duties - Precautions and Statutory Protection and rights - Dishonor of Cheques – Grounds of Dishonor – Consequences of wrongful dishonor of Cheques;
Collecting Banker: Introduction - Meaning – Legal status of collecting banker - Holder for value -Holder in due course – Duties & Responsibilities - Precautions and Statutory Protection to Collecting Banker.

Module: 2 – CUSTOMERS & ACCOUNT HOLDERS **12 Hrs**

Introduction - Types of Customers and Account Holders - Procedure and Practice in opening and operating accounts of different customers: Minors - Joint Account Holders- Partnership Firms - Joint Stock companies - Executors and Trustees - Clubs and Associations and Joint Hindu Undivided Family.

Module: 3 – NEGOTIABLE ISTRUMENTS **12 Hrs**

Introduction – Meaning & Definition – Features – Kinds of Negotiable Instruments: Promissory Notes - Bills of Exchange - Cheques - Crossing of Cheques – Types of Crossing; Endorsements: Introduction - Meaning - Essentials & Kinds of Endorsement – Rules of endorsement.

Module: 4 – RECENT DEVELOPMENTS IN BANKING **12 Hrs**

Introduction - New technology in Banking – E-services – Debit and Credit cards - Internet Banking-Electronic Fund Transfer- MICR – RTGS - NEFT –ECS- Small banks-Payment banks- Digital Wallet-Crypto currency- KYC norms – Basel Norms - Mobile banking-E-payments - E-money. Any other recent development in the banking sector.

SKILL DEVELOPMENT ACTIVITIES:
- Refer RBI website and identify the different types of banks operating in India.
- Visit any Public sector bank & discuss with the branch manager about the role and functions as a paying and collecting banker.
- Collect and fill dummy account opening forms as different types of customer
- Draft specimen of Negotiable instruments: bill of exchange, Promissory Notes and Cheques.

BOOKS FOR REFERENCE
1. Gordon & Natarajan - Banking Theory Law and Practice - HPH
2. S. P Srivastava - Banking Theory & Practice
3. Maheshwari. S.N - Banking Law and Practice, Kalyani Publishers
4. Shekar. K.C - Banking Theory Law and Practice, Vikas Publication
5. Dr. Alice Mani - Banking Law and Operation - SBH.

ANNEXURE –

OPEN ELECTIVES

Name of the Program: Bachelor of commerce (B.Com.)
Course Code: B.Com. 1.5 (a)
Name of the Course: Accounting for Everyone

Course Credits	No. of Hours per week	Total No. of Teaching Hours
3 Credits	3 Hrs	40 Hrs

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies & field work

Course Outcomes:
On successful completion of the course, the students will be able to acquire basic knowledge on financial accounting and to impart preliminary skills for recording various kinds of financial transactions.

Syllabus

Module: 1 – Introduction to Accounting   **12 Hrs**

Accounting – Meaning, Importance and Need, Its objectives and relevance to business establishments and other organizations and individuals; Accounting Concepts & Conventions
Some Basic Terms –Transaction, Account, Asset, Liability, Capital, Expenditure & Expense, Income, Revenue, Gain, Profit, Surplus, Loss, Deficit. Debit, Credit, Accounting Year, Financial Year.

Module: 2 – Recording of Transactions   **12 Hrs**
Transactions and recording of transactions Features of recordable transactions and events, Recording of transactions: Personal account, Real Account and Nominal Account; Rules for Debit and Credit;
Double Entry System, journalizing transactions; Preparation of Ledger – Simple problems

Module: 3 – Final Accounts of Sole Proprietorship Concerns   **12 Hrs**
Fundamental Accounting Equation; Preparation of Trial Balance; Concept of revenue and Capital; Preparation of Trading and Profit & Loss Account, Balance Sheet

Module: 4 – Computerized Accounting   **4 Hrs**

Introduction to Computerized Accounting Systems: Introduction to popular accounting softwares

Skill Developments Activities:
- Prepare a set of Final Accounts with imaginary figures
- List out the popular Accounting Software in practice
- Visit an outlet near your place and understand the process of accounting followed

Reference Books:
1. Hatfield, L - Accounting Basics - Amazon Digital Services LLC.
2. Dr. Muralidhar S & others – Basics of Financial Accounting – Kalyani Publishers
3. Horngren, C. T., Sundem, G. L., Elliott, J. A., & Philbrick, D - Introduction to Financial Accounting - Pearson Education
4. Siddiqui, S. A - Book Keeping &Accountancy -Laxmi Publications Pvt. Ltd.
5. Sehgal, D - Financial Accounting -Vikas Publishing House Pvt. Ltd
6. Tulsian, P. C - Financial Accounting - Tata McGraw Hill Publishing Co. Ltd.
7. Mukharji, A., & Hanif, M - Financial Accounting - Tata McGraw Hill Publishing Co. Ltd.
8. Maheshwari, S. N., Maheshwari, S. K., & Maheshwari, S. K - Financial Accounting - Vikas Publishing House Pvt. Ltd
9. Mukherjee, S., & Mukherjee, A. K - Financial Accounting - Oxford University Press
10. Jain, S. P., & Narang, K. L – Financial Accounting – Kalyani Publishers

Name of the Program: Bachelor of commerce (B.Com.)
Course Code: B.Com. 1.5 (b)
Name of the Course: Financial Literacy

Course Credits	No. of Hours per week	Total No. of Teaching Hours
3 Credits	3 Hrs	40 Hrs

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies & field work

Course Outcomes:
On successful completion of the course, the students will be able to understand the basics of savings, investments, institutions, financial markets, insurance which enables the student to take sound financial decisions

Syllabus

Module: 1 – Basics of Savings and Investment   10 Hrs
Concept of Savings & Investment; Savings Vs Investment, Power of Compounding; investment objectives; Risk and Return; Inflation effects on Investment; Various Assets Class

Module: 2 - Financial Markets   10 Hrs
Capital Market; Money Market, Securities - Equity, Debentures or Bonds, IPOs and FPOs, Mutual Funds, Types of Mutual Funds, Brokers, sub-brokers, Process for becoming a capital market investor

Module: 3 – Insurance Products   10 Hrs
Insurance Policies - Life Insurance, Term Life Insurance, Endowment Policies, Pension Policies, ULIP, Health Insurance and its Plans, Understanding of Ponzi Schemes

Module: 4 - Tax saving Schemes   10 Hrs
Government Schemes; National Saving Certificates; Public Provident Fund; Post Office Schemes; Equity Linked Savings Schemes; Retirement Benefits Schemes - NPS (New Pension System)

Skill Development:
- Analyze the risk-return factors of any 4 asset classes
- List out the top 10 Mutual Funds based on their performance for the past 5 years
- List out at least 10 stock-brokers in Equity Markets
- List out the 10 IPOs that have been issued in the recent past
- Critically analyze the performance of PPF & ELSS

Books for Reference:
1. Meir Kohn - Financial Institutions and Markets - Tata Mc Graw Hill
2. R.M Srivastava & D. Nigam - Dynamics of Financial Markets & Institutions in India - Excel Books
3. L M Bhole - Financial Institutions and Markets - Tata Mc Graw Hill
4. Murthy E.N - International Finance & Risk Management
5. Howells, P and K. Bain - Financial Markets and Institutions - Prentice Hall
6. Valdez, S. & P. Molyneux - An Introduction to Global Financial Markets - Macmillan
7. Mishkin, F. and S. Eakins - Financial Markets and Institutions - Pearson Education
8. Dr. K. Venkataramanappa - SHB Publications

Name of the Program: Bachelor of commerce (B.Com.)
Course Code: B.Com. 1.5 (c)
Name of the Course: Entrepreneurship & Start-ups

Course Credits	No. of Hours per week	Total No. of Teaching Hours
3 Credits	3 Hrs	40 Hrs

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies & field work

Course Outcomes:
On successful completion of the course, the students develop the entrepreneurship abilities and opportunities and the course aims at imparting skills and techniques of exploring these opportunities through the formulation of a bankable project. It is also aimed to study the formalities of setting up of a company and its management

Syllabus

Module: 1 - INTRODUCTION TO ENTREPRENEURSHIP   10 Hrs

Introduction – Meaning& Definition of Entrepreneurship, Entrepreneur & Enterprise –Functions of Entrepreneur - Factors influencing Entrepreneurship - Pros and Cons of being an entrepreneur – Qualities of an Entrepreneur – Types of Entrepreneurs

Module: 2 – BUSINESS PLAN   10 Hrs

Business model: Meaning, designing, analyzing and improvising;
Business Plan – Meaning, Scope and Need;
Financial, Marketing, Human Resource and Production/Service Plan;
Business plan Formats; Project report preparation and presentation;
Why some Business Plan fails?

Module: 3 – FORMATION OF A BUSINESS ENTITY   08 Hrs

Business opportunity, scanning the environment for opportunities, evaluation of alternatives and selection based on personal competencies. Steps involved in the formation of a small business venture: location, clearances and permits required, formalities, licensing and registration procedure. Assessment of the market for the proposed project – Financial, Technical, Market and Social feasibility study.

Module: 4 – GOVERNMENT SCHEMES & POLICIES   12 Hrs

Government Schemes and Policies for Entrepreneurship Development: Start up India, Make in India, Atal Innovation Mission, STEP, JAM, STAND-UP India, TREAD, PMKVY, Schemes of DST, DIPP, MSME Single Point Registration Scheme, Ministry of Agriculture and Farmers Welfare-The Venture Capital Assistance Scheme, GoI-Pradhan Mantri Mudra Yojana, Small Industries Development Bank of India (SIDBI), Sustainable Finance Scheme, Department Of Science & Technology (DST)

Skill Developments Activities:
- A detailed Business plan is to be prepared, submitted and presented as process of CEE
- Preparation of a Project report to start a SSI Unit.
- Preparing a letter to the concerned authority-seeking license for the proposed SS Unit
- Format of a business plan.
- A Report on the survey of SSI units in the region where college is located.
- Chart showing financial assistance available to SSI along with rates of interest.
- Chart showing tax concessions to SSI both direct and indirect.
- Success stories of Entrepreneurs in the region

REFERENCE BOOKS

1. Vasanth Desai - Management of Small Scale Industry - HPH
2. Mark. J. Dollinger - Entrepreneurship – Strategies and Resources - Pearson Edition
3. Dr. Venkataramana - Entrepreneurial Development - SHB Publications
4. Udai Pareek and T.V. Rao, - Developing Entrepreneurship
5. Rekha & Vibha – Entrepreneurship Development - VBH
6. S.V.S. Sharma - Developing Entrepreneurship, Issues and Problems
7. B. Janakiraman , Rizwana M - Entrepreneurship Development - Excel Books
8. Srivastava - A Practical Guide to Industrial Entrepreneurs
9. Anil Kumar - Small Business and Entrepreneurship I.K. International Publishers
10. Government of India, Report of the committee on Development of small and medium entrepreneurs, 1975
11. Bharusali - Entrepreneur Development
12. Satish Taneja - Entrepreneur Development
13. Vidya Hattangadi - Entrepreneurship
14. N.V.R Naidu - Entrepreneurship Development, I.K. International Publishers

Name of the Program: Bachelor of commerce (B.Com.)
Course Code: B.Com. 2.5 (a)
Name of the Course: Financial Environment

Course Credits	No. of Hours per week	Total No. of Teaching Hours
3 Credits	3 Hrs	40 Hrs

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies & field work

Course Outcomes:
On successful completion of the course, the students will be able to understand the conceptual framework of the fundamentals of Indian Economy and its significance, evaluate the impact of monetary policy on the stakeholders of the economy, assess the impact of fiscal policy on the stakeholders of the economy & the financial sector reforms in India.

Syllabus

Module: 1 - Fundamentals of Indian Economy   10 Hrs
Introduction - Production & Cost-Demand & Supply-Perfect & Imperfect Competition-Monopoly-National Income Accounting-Business Cycle-Open Economy-Utility theory-GDP-GNP-impact- other Marco financial indicators

Module: 2 - MONETARY POLICY   10 Hrs
Introduction - Meaning-objectives-qualitative & quantitative measures for credit control. Influence of policy rates of RBI: Repo-Reverse repo- Marginal standing facility and Bank rate. Influence of reserve ratios of RBI: CRR-SLR-Exchange rates-lending/deposit rates-design & issues of monetary policy-LAF - RBI Role, functions and its Governance

Module: 3- FISCAL POLICY   10 Hrs
Introduction - Meanings-objectives- public expenditure-public debt-fiscal & budget deficit-Keynesian approach-fiscal policy tools-fiscal policy effects on employment-supply side approach-design & issues of fiscal policy-fiscal budget- Role of Ministry of Finance in Fiscal Policy.

Module: 4 - FINANCIAL SECTOR REFORMS   10 Hrs
Introduction - Financial sector reforms - Recommendation & action taken -SARFESI Act- Narasimham Committee I & II- Kelkar Committee- FRBM Act - Basel-BIS-history-need-mission-objectives-Basel norms I, II & III- criticism of Basel norms-Implementations of Basel norms in India- impact of Basel norms on Indian banks.

Skill Development:
1. Collect last ten year GDP rate and examine the same.
2. Collect last two years monetary policy rates of RBI and analyse the impact of the same
3. Collect last five years fiscal policy of Indian Government and analyse the impact of the same on rural poor.
4. Collect last five year data on inflation, unemployment rate and labour market conditions and critically prepare the report.
5. Identify the recent financial sector reforms in India
6. Any other activities, which are relevant to the course.

Books for Reference:
1. V K Puri and S K Mishra, Indian Economy, HPH.
2. Datt and Sundharam's, Indian Economy, S Chand
3. Ramesh Singh, Indian Economy, McGraw Hill education.
4. Khan and Jain, Financial Services, Mcgraw Hill Education, 8th edition
5. RBI working papers
6. Mistry of Finance, GOI of working papers
7. SEBI Guidelines Issued from time to time

Name of the Program: Bachelor of commerce (B.Com.)
Course Code: B.Com. 2.5 (b)
Name of the Course: Investing in Stock Markets

Course Credits	No. of Hours per week	Total No. of Teaching Hours
3 Credits	3 Hrs	40 Hrs

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies & field work

Course Outcomes:
On successful completion of the course, the students will be able to understand the basics of investing in the stock market, the investment environment as well as risk & return; analyze Indian securities market; examine EIC framework and conduct fundamental analysis; perform technical analysis; invest in mutual funds market.

Syllabus

Module: 1- BASICS OF INVESTING   10 Hrs
Basics of Investment & Investment Environment. Risk and Return, Avenues of Investment - Equity shares, Preference shares, Bonds & Debentures, Insurance Schemes, Mutual Funds, Index Funds. Indian Security Markets - Primary Market, Secondary Market and Derivative Market. Responsible Investment.

Module: 2-FUNDAMENTALS ANALYSIS   10 Hrs
Top down and bottom-up approaches, Analysis of international & domestic economic scenario, Industry analysis, Company analysis (Quality of management, financial analysis: Both Annual and Quarterly, Income statement analysis, position statement analysis including key financial ratios, Cash flow statement analysis, Industry market ratios: PE, PEG, Price over sales, Price over book value, EVA), Understanding Shareholding pattern of the company.

Module: 3 – TECHNICAL ANALYSIS   10 Hrs
Trading rules (credit balance theory, confidence index, filter rules, market breath, advances vs declines and charting (use of historic prices, simple moving average and MACD) basic and advanced interactive charts. Do's & Don'ts of investing in markets.

Module: 4 - INDIAN STOCK MARKETS   10 Hrs
Market Participants: Stock Broker, Investor, Depositories, Clearing House, Stock Exchanges. Role of stock exchange, Stock exchanges in India- BSE, NSE and MCX. Security Market Indices: Nifty, Sensex and Sectoral indices, Sources of financial information. Trading in securities: Demat trading, types of orders, using brokerage and analyst recommendations

Skill Development:
1. Work on the spreadsheet for doing basic calculations in finance.
2. Learners will also practice technical analysis with the help of relevant software.
3. Practice use of Technical charts in predicting price movements through line chart, bar chart, candle and stick chart, etc., moving averages, exponential moving average.
4. Calculate of risk and return of stocks using price history available on NSE website.
5. Prepare equity research report-use of spreadsheets in valuation of securities,

Books for Reference:
1. Chandra, P. (2017). Investment Analysis and Portfolio Management. New Delhi: Tata McGraw Hill Education.
2. Kevin, S. (2015). Security Analysis and Portfolio Management. Delhi: PHI Learning. Ranganatham,
3. M., & Madhumathi, R. (2012). Security Analysis and Portfolio Management. Uttar Pradesh: Pearson (India) Education.
4. 4. Pandian, P. (2012). Security Analysis and Portfolio Management. New Delhi: Vikas Publishing House

Name of the Program: Bachelor of commerce (B.Com.)
Course Code: B.Com. 2.5 (c)
Name of the Course: Event Management

Course Credits	No. of Hours per week	Total No. of Teaching Hours
3 Credits	3 Hrs	40 Hrs

Pedagogy:
Classroom lecture, tutorials, Group discussion, Seminar, Case studies & field work

Course Outcomes:
On successful completion of the course, the students will be able to understand the conceptual framework of Event Management, Event Services, Conducting Event and Managing Public Relations

Syllabus

Module: 1- INTRODUCTION TO EVENT MANAGEMENT   **10 Hrs**
Event- Meaning- Why Event Management- Analysis of Event, Scope of Event, Decision Makers- Event Manager Technical Staff- Establishing of Policies & Procedure- Developing Record Keeping Systems.

Module: 2-EVENT MANAGEMENT PROCEDURE   **10 Hrs**
Principles for holding an Event, General Details, Permissions- Policies, Government and Local Authorities, - Phonographic Performance License, Utilities- Five Bridge Ambulance Catering, Electricity, Water Taxes Applicable.

Module: 3-CONDUCT OF AN EVENT   **10 Hrs**
Preparing a Planning Schedule, Organizing Tables, Assigning Responsibility, Communication and Budget of Event- Checklist, Computer aided Event Management– Roles & Responsibilities of Event Managers for Different Events.

Module: 4 CORPORATE EVENTS   **10 Hrs**
Planning of Corporate Event, Job Responsibility of Corporate Events Organizer, Arrangements, Budgeting, Safety of Guests and Participants, Creating Blue Print, Need for Entertainment in Corporate Events And Reporting.

Skill Development:
1. Preparation of Event Plan for Wedding, Annual general body Meeting of an MNC.
2. Preparing Budget for conduct of National level intercollegiate sports events.
3. Preparation of Event Plan for College day Celebrations
4. Preparation of Budget for Conducting inter collegiate Commerce Fest.

Books for Reference:

1. Event Entertainment and Production – Author: Mark Sonderm CSEP Publisher: Wiley & Sons, Inc.
2. Dr. Muralidhar & others – Event Management – Kalyani Publishers
3. Ghouse Basha – Advertising & Media Mgt, VBH.
4. Anne Stephen – Event Management, HPH.
5. K. Venkataramana, Event Management, SHBP.
6. Special Event Production – Doug Matthews – ISBN 978-0-7506-8523-8
7. The Complete Guide to successful Event Planning – Shannon Kilkenny
8. Human Resource Management for Events – Lynn Van der Wagen (Author)
9. Successful Team Manageemnt (Paperback) – Nick Hayed (Author)
10. Event Management & Public Relations by Savita Mohan – Enkay Publishing House
11. Event Management & Public Relations By Swarup K. Goyal – Adhyayan Publisher - 2009

ಬೆಂಗಳೂರು ಉತ್ತರ ವಿಶ್ವವಿದ್ಯಾಲಯ

ಟಮಕ, ಕೋಲಾರ – 563103

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: BACHELOR OF BUSINESS ADMINISTRATION

2021-22 onwards

CURRICULUM AND REGULATIONS OF BBA DEGREE
(REGULAR & HONOURS)
Under the National Education Policy – 2020

ಬೆಂಗಳೂರು ಉತ್ತರ ವಿಶ್ವವಿದ್ಯಾಲಯ
BENGALURU NORTH UNIVERSITY

SRI DEVARAJ URS, EXTENSION TAMAKA,
KOLAR – 563103.

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PROF. NIRMALA. K

DR. S. RADHA

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THE NATIONAL EDUCATIONAL POLICY 2020

The approval of the National Education Policy (NEP) by the Ministry of Human Resource Development, Government of India has been well deliberated as discussed from the last 4 years and more. The advent of industry 4.0 scenario has led our current system of education outdated. Hence, the NEP is designed to contemplate the current skill requirements. The Indian education system with its earlier policies on education has greatly led to creation of fragmented system of education. However, bringing the whole system into one large umbrella remains a key issue. The current NEP has attempted to cure the same by getting rid of standalone institutions and institutions of affiliated nature and proposed formation and upgradation of institutions to offer multidisciplinary education. Multidisciplinary education system with inbuilt flexibility for both undergraduate as well as post graduate and research level is a key highlight of the NEP. It focuses on promoting and building vocational skills/skill enhancement courses, right from the school level, which can ease the burden on the employment opportunities and supply of proficient/talented workforce. As the experts rightly put it as the syllabi which academia develops should be student centric rather than teacher centric, which used to be so far. As already the Union Cabinet has approved the NEP 2020, it aims to pave way for transformational reforms in school and higher education systems in the country. This policy will replace the 34- year-old National Policy on Education (NPE), 1986.

VISION OF THE NATIONAL EDUCATION POLICY 2020

- An education system that contributes to an equitable and vibrant knowledge society, by providing high-quality education to all.

- Develops a deep sense of respect towards the fundamental rights, duties and Constitutional values, bonding with one's country, and a conscious awareness of one's role and responsibilities in a changing world.

- Instils skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen.

This National Education Policy 2020 is the first education policy of the 21st century and aims to address the many growing developmental aspirations of our country. This Policy proposes the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirations & goals of 21st century education, including SDG4, while building upon India's traditions and value systems. NEP aims for India to have an education system by 2040 that is second to none, with equitable access to the highest-quality education for all learners regardless of social or economic background and seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2040." The whole of the NEP policy is a medication to cure the shortcomings in the education system for the last 35 to 36 years. The failure or success of the NEP will rely completely on the implementation and its acceptance by the stakeholders. For which we need to join hands in strengthening the system.

The BBA Programme provides a best career opportunist for students to develop managerial and entrepreneurial skills in order to pursue employment opportunities in the corporate sector or venture into their own business. The course takes a student over the functional areas of management including manufacturing, marketing, finance, HRM, sales, strategy management etc. … Plus, soft skill development such as communication, attitude, leadership and other skills.

I. OBJECTIVES OF THE BBA DEGREE
- To develop entrepreneurism by equipping them with all the skills and knowledge required to start a business.
- To develop ethical managers with inter disciplinary knowledge
- To enable students to apply knowledge of management theories and practices to solve business problems.
- To promote ethical and value-based leadership ability.
- To equip students for the world of work, particularly the work of the future.
- To enable students to demonstrate use of appropriate techniques to effectively manage business challenges.
- To encourage analytical and critical thinking abilities for business decision making.
- To empower students to take up competitive examinations like UPSC, KPSC, and other examinations.

II. GRADUATE ATTRIBUTES
The graduate attributes are the outline of the expected course learning outcomes mentioned in the beginning of each course. The characteristic attributes that a graduate will be able to demonstrate through learning various courses which are listed below:

DISCIPLINARY KNOWLEDGE
Capability of executing comprehensive knowledge and understanding of one or more disciplines that form part of commerce.

COMMUNICATION SKILLS
- Ability to communicate long standing, unsolved problems in commerce.
- Ability to show the importance of commerce as precursor to various market developments since the beginning of civilization.

CRITICAL THINKING
- Ability to engage in reflective and independent thinking by understanding the concepts in every area of Commerce and Business.
- ii.Ability to examine the results and apply them to various problems appearing in different branches of Commerce and Business.

PROBLEM SOLVING
- Capability to reduce a business problem and apply the classroom learning into practice to offer a solution for the same.
- ii. Capabilities to analyse and synthesize data and derive inferences for valid conclusions.
- iii. Able to comprehend solutions to sustain problems originating in the diverse management areas such as Finance, Marketing, Human Resource, Taxation and so on

RESEARCH RELATED SKILLS
- Ability to search for, locate, extract, organise, evaluate, and use or present information that is relevant to a particular topic.
- Ability to identify the developments in various branches of Commerce and Business.

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) DIGITAL LITERACY
- Capability to use various ICT tools (like spreadsheet) for exploring, analysis, and utilizing the information for business purposes.

SELF-DIRECTED LEARNING
- Capability to work independently in diverse projects and ensure detailed study of various facets of Commerce and Business.

MORAL AND ETHICAL AWARENESS/REASONING
- Ability to ascertain unethical behaviour, falsification, and manipulation of information. ii. Ability to manage self and various social systems.

LIFE-LONG LEARNING
- Capability of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Commerce.

III. ELIGIBILITY FOR ADMISSION
Candidates who have completed two years Pre – University course in any discipline of Karnataka State or its equivalent as notified by the university from time to time are eligible to seek admission for this course.

IV. DURATION OF THE PROGRAMME

The Duration of the Programme is Four (04) years of Eight Semesters. Progressive Certificate, Diploma, Bachelor Degree or Bachelor Degree with Honors provided at the end of each year of Exit of the four years Undergraduate Programme as the case maybe as follows:

YEAR	EXIT OPTION WITH	CREDITS REQUIREMENT*
CBA	On successful completion of Two Semesters of BBA at the end of First year, the student will be eligible for the award of CERTIFICATE IN BUSINESS ADMINISTRATION	48
DBA	On successful completion of four Semesters of BBA at the end of Second year, the student will be eligible for the award of DIPLOMA IN BUSINESS ADMINISTRATION	96 (48+48)
BBA	On successful completion of Six Semesters of BBA at the end of Third year, the student will be eligible for the award of BACHELOR'S DEGREE IN BUSINESS ADMINISTRATION	138 (48+48+42)
BBA (H)	On successful completion of Eight Semesters of BBA at the end of fourth year, the student will be eligible for the award of HONOURS DEGREE IN BUSINESS ADMINISTRATION	180 (48+48+42+42)

V. MEDIUM OF INSTRUCTION

The medium of instruction shall be English only.

VI. ATTENDANCE

- For the purpose of calculating attendance, each semester shall be taken as a Unit.
- A student shall be considered to have satisfied the requirement of attendance for the semester, if he/she has attended not less than 75% in aggregate of the number of working periods in each of the courses compulsorily.
- A student who fails to satisfy the above condition shall not be permitted to take the University examination.

VII. TEACHING AND EVALUATION

M.Com/MBA/MBS graduates with B.Com, B.B.M, and BBA & BBS as basic degrees from a recognized university are only eligible to teach and to evaluate the Courses (except languages, compulsory additional subjects and core Information Technology related subjects) mentioned in this regulation. Languages and additional courses shall be taught by the graduates as recognized by the respective Board of Studies.

VIII. RECORD MAINTENANCE AND SUBMISSION

- Every college is required to establish an Innovative business lab / computer lab to enable students to get practical knowledge of business activities and online learning.
- In every semester, the student should keep a record of the Business Lab/Field Study Activity and submit it to the concerned faculty.
- The BOE is authorized to make random surprise visits to the colleges and verify record-books and the internal marks awarded.

IX. GUIDELINES FOR CONTINUOUS INTERNAL EVALUATION (CIE) AND SEMESTER END EXAMINATION (SEE)

The CIE and SEE will carry 40% and 60% weightage each, to enable the course to be evaluated for a total of 100 marks, irrespective of its credits. The evaluation system of the course is comprehensive & continuous during the entire period of the Semester. For a course, the CIE and SEE evaluation will be on the following parameters:

SL No.	Parameters for the Evaluation	Marks
CONTINUOUS INTERNAL EVALUATION (CIE) – (A + B)		
A	Continuous & Comprehensive Evaluation (CCE)	20 Marks
B	Internal Assessment Tests (IAT)	20 Marks
C	Semester End Examination (SEE)	60 Marks
	TOTAL OF CIE AND SEE (A + B + C)	100 MARKS

A. CONTINUOUS & COMPREHENSIVE EVALUATION (CCE):

The CCE will carry a maximum of 20% weightage (20 marks) of total marks of a course. The faculty member can select any four of the following assessment methods, Minimum of four of the following assessment methods of 5 marks each:

- Individual Assignments
- Seminars/Classroom Presentations/ Quizzes
- Group Discussions /Class Discussion/ Group Assignments
- Case studies/Caselets
- Participatory & Industry-Integrated Learning/ Field visits
- Practical activities / Problem Solving Exercises
- Participation in Seminars/ Academic Events/Symposia, etc.
- Mini Projects/Capstone Projects
- Any other academic activity.

B. INTERNAL ASSESSMENT TESTS (IAT):

The IAT will carry a maximum of 20% weightage (20 marks) of total marks of a course, under this component, two tests will have to be conducted in a semester for 25 marks each and the same is to be scaled down to 10 marks each. Standard format is given below.

C. 50 PERCENT OF CIE

In the case of 50 percent of CIE weightage courses, faculty members can choose assessment methods accordingly for the required marks as mentioned above.

TEMPLATE FOR IAT QUESTION PAPER

INTERNAL ASSESSMENT TEST					
Name of the Course					
Name of the Subject:					
Subject Code:	BBA--	Duration:	1 HOURS	Total Marks	25
SECTION–A	Answer any two of the following three questions. (Questions related to Concepts)				2 X 2 = 4
SECTION–B	Answer any two of the following three questions. (Questions related to Understanding and Application)				2 X 5 = 10
SECTION- C	Answer any one of the following questions. (Questions related to analysis and evaluation)				1 X 11 = 11

X. APPEARANCE FOR THE EXAMINATION

A candidate shall be considered to have appeared for the examination only if he/she has submitted the prescribed application for the examination along with the required fees to the university.

XI. PATTERN OF QUESTION PAPER

SEMESTER END UNVERSITY QUESTION PAPER TEMPLATE					
Name of the Course					
Name of the Subject:					
Subject Code:		Duration:	3 HOURS	Total Marks	60
SECTION–A	Answer any FIVE out of SEVEN sub questions (CONCEPTUAL QUESTIONS)			05 X 02 = 10 Marks	
SECTION–B	Answer any THREE out of FIVE questions (APPLICATION QUESTIONS)			03 X 05 = 15 Marks	
SECTION– C	Answer any THREE out of FIVE questions (ANALYSIS AND UNDERSTANDING QUESTIONS)			03 X 08 = 24 Marks	
SECTION– D	Answer any ONE out of TWO questions Question completely based on the SKILL BASED (LAB ACTIVITIES) OR A CASE STUDY.			01 X 11 = 11 Marks	

COURSE MATRIX

			I SEMESTER					
SL. NO	COURSE CODE	TITLE OF THE COURSE	CATEGORY OF COURSES	TEACHING HOURS PERWEEK (L + T + P)	SEE	CIE	TOTAL MARKS	CREDITS
1	LANG.1.1	Language – I	AECC	3+1+0	60	40	100	3
2	LANG.1.2	Language – II	AECC	3+1+0	60	40	100	3
3	BBA.1.1	Corporate Management & Behaviour	DSC	4+0+0	60	40	100	4
4	BBA.1.2	Accounting for Business	DSC	3+0+2	60	40	100	4
5	BBA.1.3	Marketing Management	DSC	4+0+0	60	40	100	4
6	BBA.1.4	Digital Proficiency for Business	SEC–SB	1+0+2	50	50	100	2
7	BBA.1.5	Office Management / Retailing Management / Business Management	OEC	3+0+0	50	50	100	3
				SUB TOTAL – I	400	300	700	23

			II SEMESTER					
SL. NO	COURSE CODE	TITLE OF THE COURSE	CATEGORY OF COURSES	TEACHING HOURS PERWEEK (L + T + P)	SEE	CIE	TOTAL MARKS	CREDITS
8	Lang.2.1	Language – I	AECC	3+1+0	60	40	100	3
9	Lang.2.2	Language – II	AECC	3+1+0	60	40	100	3
10	BBA.2.1	Financial Accounting and Reporting	DSC	3+0+2	60	40	100	4
11	BBA.2.2	Human Resource Management	DSC	4+0+0	60	40	100	4
12	BBA.2.3	Bumastics	DSC	3+0+2	60	40	100	4
13	BBA.2.4	Health Wellness / Social & Emotional Learning	SEC–VB	1+0+2	–	100	100	2
14	BBA.2.5	Environmental Studies	AECC	2+0+0	50	50	100	2
15	BBA.2.6	Talent Management / Digital Marketing / Entrepreneurship	OEC	3+0+0	50	50	100	3
				SUB TOTAL – II	400	400	800	25

III SEMESTER								
SL. NO	COURSE CODE	TITLE OF THE COURSE	CATEGORY OF COURSES	TEACHING HOURS PER WEEK (L + T + P)	SEE	CIE	TOTAL MARKS	CREDITS
16	Lang.3.1	Language – I	AECC	3+1+0	60	40	100	3
17	Lang.3.2	Language – II	AECC	3+1+0	60	40	100	3
18	BBA.3.1	Cost Accounting	DSC	3+0+2	60	40	100	4
19	BBA.3.2	Global Business Ecosystem	DSC	4+0+0	60	40	100	4
20	BBA.3.3	Disaster Management	DSC	3+0+2	60	40	100	4
21	BBA.3.4	Artificial Intelligence	SEC	1+0+2	50	50	100	2
22	BBA.3.5	Advertising / Financial Literacy / Services Marketing	OEC	3+0+0	50	50	100	3
				SUB TOTAL – III	400	300	700	23

IV SEMESTER								
SL. NO	COURSE CODE	TITLE OF THE COURSE	CATEGORY OF COURSES	TEACHING HOURS PER WEEK (L + T + P)	SEE	CIE	TOTAL MARKS	CREDITS
23	Lang.4.1	Language – I	AECC	3+1+0	60	40	100	3
24	Lang.4.2	Language – II	AECC	3+1+0	60	40	100	3
25	BBA.4.1	Accounting for Decision Making	DSC	3+0+2	60	40	100	4
26	BBA.4.2	Business Analytics	DSC	3+0+2	60	40	100	4
27	BBA.4.3	Financial Management	DSC	3+0+2	60	40	100	4
28	BBA.4.4	Constitution of India	AECC	2+0+0	50	50	100	2
29	BBA.4.5	Sports/NCC/NSS/others (if any)	SEC-VB	1+0+2	–	100	100	2
40	BBA.4.6	Insurance / Banking Operations / Travel & Tourism	OEC	3+0+0	50	50	100	3
				SUB TOTAL - IV	400	400	800	25

			V SEMESTER					
SL. NO	COURSE CODE	TITLE OF THE COURSE	CATEGORY OF COURSES	TEACHING HOURS PER WEEK (L + T + P)	SEE	CIE	TOTAL MARKS	CREDITS
31	BBA.5.1	Manufacturing and Operations Management	DSC	4+0+0	60	40	100	4
32	BBA.5.2	Income Tax	DSC	3+0+2	60	40	100	4
33	BBA.5.3	Elective–1	DSE	4+0+0	60	40	100	4
34	BBA.5.4	Elective–2	DSE	4+0+0	60	40	100	4
35	BBA.5.5	Information Technology for Managers	Vocational – 1	1+0+2	60	40	100	3
36	BBA.5.6	Cyber Security	SEC – VB	1+0+2	50	50	100	2
				SUB TOTAL – V	350	250	600	21

			VI SEMESTER					
SL. NO	COURSE CODE	TITLE OF THE COURSE	CATEGORY OF COURSES	TEACHING HOURS PER WEEK (L + T + P)	SEE	CIE	TOTAL MARKS	CREDITS
37	BBA.6.1	Business Regulation	DSC	4+0+0	60	40	100	4
38	BBA.6.2	Entrepreneurship & Startup Management	DSC	3+0+2	60	40	100	4
39	BBA.6.3	Elective – 3	DSE	4+0+0	60	40	100	4
40	BBA.6.4	Elective – 4	DSE	4+0+0	60	40	100	4
41	BBA.6.5	Goods & Services Tax (GST)	Vocational–2	1+0+2	60	40	100	3
42	BBA.6.6	Content and Technical Writing	SEC – SB	1+0+2	50	50	100	2
				SUB TOTAL – VI	350	250	600	21

VII SEMESTER								
SL. NO	COURSE CODE	TITLE OF THE COURSE	CATEGORY OF COURSES	TEACHING HOURS PER WEEK (L + T + P)	SEE	CIE	TOTAL MARKS	CREDITS
44	BBA.7.1	Corporate Ethics & Governance	DSC	4+0+0	60	40	100	4
45	BBA.7.2	E – Business	DSC	4+0+0	60	40	100	4
46	BBA.7.3	Advance Statistics for Business Research	DSC	2+0+2	60	40	100	3
47	BBA.7.4	Elective – 5	DSE	4+0+0	60	40	100	4
48	BBA.7.5	Selected Statistical Software Application	Vocational–3	1+0+2	60	40	100	3
49	BBA.7.6	Research Methodology	DSC	3+1+0	60	40	100	3
				SUB TOTAL – VII	350	250	600	21

VIII SEMESTER								
SL. NO	COURSE CODE	TITLE OF THE COURSE	CATEGORY OF COURSES	TEACHING HOURS PER WEEK (L + T + P)	SEE	CIE	TOTAL MARKS	CREDITS
50	BBA.8.1	Strategic Management	DSC	4+0+0	60	40	100	4
51	BBA.8.2	Operations Research and Quantitative Techniques	DSC	3+0+2	60	40	100	4
52	BBA.8.3	Project Management	DSC	4+0+0	60	40	100	4
53	BBA.8.5	Digital Marketing	Vocational–4	1+0+2	60	40	100	3
54	BBA.8.5	Research Projects / Internship with Viva-voce OR Elective Paper 6 & 7 (Two Courses from the Selected Elective Group)	PR	2+4+0	140	60	200	6
			DSE	4+0+0	60	40	100	3
			DSE	4+0+0	60	40	100	3
				SUB TOTAL – VIII	500	300	800	21
				TOTAL OF I TO VIII	3510	2350	5600	180

SELECTION OF ELECTIVES

Students have to select dual electives out of the list of electives given in Fifth and Sixth Semester. Electives selected in the fifth semester should be continued in the sixth semester. However they can change the electives in the seventh semester. The electives selected in the seventh semester will continue in the eighth semester.

EXIT OPTION WITH BACHELOR DEGREE

Ability to solve complex problems that are ill-structured requiring multi-disciplinary skills to solve them.

BACHELOR DEGREE WITH HONORS

Experience of workplace problem solving in the form of internship or research experience preparing for higher education or entrepreneurship experience.

NOTES

One Hour of Lecture	1 Credit.
One Hour of Tutorial	1 Credit. (Except Languages).
Two Hours of Practical	1 Credit.

ACRONYMS EXPANDED

AECC	Ability Enhancement Compulsory Course
DSC ©	Discipline Specific Core (Course)
SEC-SB/VB	Skill Enhancement Course-Skill Based/Value Based
OEC	Open Elective Course
DSE	Discipline Specific Elective
SEE	Semester End Examination
CIE	Continuous Internal Evaluation
L+T+P	Lecture + Tutorial + Practical(s)

Note: *Practical Classes may be conducted in the Business Lab or in Computer Lab or in Class room depending on the requirement. One batch of students should not exceed half (i.e., 40 or less than 40 students) of the number of students in each class/section. 2 Hours of Practical Class is equal to 1 Hour of Teaching, however, whenever it is conducted for the entire class (i.e., more than 40 students) 2 Hours of Practical Class is equal to 2 Hours of Teaching.*

ELECTIVE GROUPS AND COURSES

V SEMESTER		
	FINANCE	Advanced Corporate Financial Management
	MARKETING	Consumer Behavior
	HUMAN RESOURCE MANAGEMENT	Compensation and Performance Management
	DATA ANALYTICS	Financial Analytics
	RETAILING	Retail Operations Management
	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	Freight Transport Management

VI SEMESTER		
	FINANCE	Security Analysis and Portfolio Management
	MARKETING	Advertising Management & Sales promotion
	HUMAN RESOURCE MANAGEMENT	Employee Welfare & Social Security
	DATA ANALYTICS	Marketing Analytics
	RETAILING	Strategic Brand Management
	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	Sourcing for Logistics and SCM

VII SEMESTER		
	FINANCE	Strategic Financial Management
	MARKETING	Brand Management / Rural Marketing
	HUMAN RESOURCE MANAGEMENT	Labor Laws & IR
	DATA ANALYTICS	HR Analytics
	RETAILING	Merchandising Planning and Buying
	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	Managing Procurement contract and relationship

VIII SEMESTER		
	FINANCE	Derivatives and Risk Management
		International Financial Management
	MARKETING	B to B Marketing (Industrial Marketing)
		Sales & Distribution Management
	HUMAN RESOURCE MANAGEMENT	HRD
		International HRM
	DATA ANALYTICS	Web and Social Intelligence
		Machine Learning in Business
	RETAILING	IT applications in Retail Business

		Visual Merchandising
	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	Global Environment for Supply chain Management
		International Supply Chain

NOTE: Student shall continue with the same elective group in V and VI semesters, however, he/she may change the elective group in VII semester, but shall continue in the same group in VIII semester.

Subject Name	CORPORATE MANAGEMENT & BEHAVIOUR		Subject Code	BBA 1.1
Course Credits	4	No. of Hours per Week	4	Total No. of Teaching Hours	56

PEDAGOGY
Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

COURSE OUTCOMES:
On successful completion of the course, the Students will demonstrate
- The ability to understand concepts of business management, principles and function of management.
- The ability to explain the process of planning and decision making.
- The ability to create organization structures based on authority, task and responsibilities and understand organizational Behavior, avoid conflicts, accept change and work in groups.
- The ability to explain the principles of direction, importance of communication, barrier of communication, motivation theories and leadership styles.
- The ability to understand the requirement of good control system and control techniques.

MODULE NO 1	INTRODUCTION TO BUSINESS & MANAGEMENT	10 HRS

Introduction to Business, Forms of Business Organization, their merits, limitations and formation–Meaning Nature and Characteristics of Management Scope and Functional areas of Management; Management as a Science, Art or Profession; Management and Administration; Principles of Management.

MODULE NO. 2	PLANNING AND DECISION MAKING	08 HRS

Nature, Importance and Purpose of Planning - Planning Process; Objectives; Types of plans (Meaning only); Decision making- Importance and steps; MBO and MBE (Meaning only)

MODULE NO. 3	ORGANIZING AND STAFFING	18

Nature and purpose of Organization; Principles of Organizing; Delegation of Authority; Types of Organization – Departmentation, Committees; Centralization vs Decentralization of Authority and Responsibility, Span of Control; Nature and importance of Staffing Organizational Behavior: Individual Behavior and Differences - Personality – Attitudes and Beliefs – Values - Perception – Perceptual Selectivity –Management of Stress Group Dynamics: Group Behavior–Formation - Understanding Work Groups– Conflict, Negotiation, and Intergroup Behavior - Management of Change – Resistance to Change – Organizational Development

MODULE NO. 4	DIRECTING AND COMMUNICATING	12

Meaning and Nature of Direction, Principles of Direction; Communication - Meaning and Importance, Communication Process, Barriers to Communication, Steps to overcome Communication Barriers, Types of Communication; Motivation theories – Maslow's Need Hierarchy Theory, Herzberg's Two Factor Theory, Mc.Gregor's X and Y theory. Leadership – Meaning, Formal and Informal Leadership, Characteristics of Leadership; Leadership Styles – Autocratic Style, Democratic Style, Participative Style, Laissez Faire Leadership Styles, Transition Leadership, Charismatic Leadership Style.

MODULE NO. 5	COORDINATING AND CONTROLLING	08

Coordination–Meaning, Importance and Principles. Controlling–Meaning and steps in controlling, Essentials of Effective Control system, Techniques of Control (in brief).

SKILL DEVELOPMENTS ACTIVITIES

- Two cases on the above syllabus should be analyzed by the teacher in the classroomand the same needs to be recorded by the student in the Skill Development Book.
- Draft different types of Organization structure.
- Draft Control charts.

TEXT & REFERENCE BOOKS

- Stephen P. Robbins, Management, Pearson
- Koontz and O"Donnell, Management, McGraw Hill.
- L M Prasad, Principles of management, Sultan Chand and Sons
- V.S.P Rao/Bajaj, Management process and organization, Excel Books.GH25
- Appanniah and Reddy, Management, HPH.
- T. Ramaswamy : Principles of Management, HPH.
- Aswathappa :Organisation Behaviour

NOTE: LATEST EDITION OF TEXT BOOKS MAY BE USED.

Subject Name		Accounting for Business		Subject Code		BBA 1.2
Course Credits	4	No. of Hours per Week	4	Total No. of Teaching Hours		56

PEDAGOGY
Classrooms lecture, tutorials, and problem solving.

COURSE OUTCOMES:
On successful completion of the course, the Students will demonstrate

- Understand the framework of accounting as well accounting standards.
- The Ability to pass journal entries and prepare ledger accounts
- The Ability to prepare subsidiaries books
- The Ability to prepare trial balance and final accounts of proprietary concern.
- Construct final accounts through application of tally.

MODULE NO. 1	INTRODUCTION TO FINANCIAL ACCOUNTING	08

Introduction – Meaning and Definition – Objectives of Accounting – Functions of Accounting – Users of Accounting Information – Limitations of Accounting – Accounting Cycle - Accounting Principles – Accounting Concepts and Accounting Conventions. Accounting Standards – objectives-significance of accounting standards. List of Indian Accounting Standards.

Module No. 2	ACCOUNTING PROCESS	12

Meaning of Double entry system – Process of Accounting – Kinds of Accounts – Rules - Transaction Analysis – Journal – Ledger – Balancing of Accounts – Trial Balance – Problems on Journal, Ledger Posting and Preparation of Trial Balance.

Module No. 3	SUBSIDIARY BOOKS	14

Meaning – Significance – Types of Subsidiary Books –Preparation of Purchases Book, Sales Book, Purchase Returns Book, Sales Return Book, Bills Receivable Book, Bills Payable Book. Types of Cash Book- Simple Cash Book , Double Column Cash Book , Three Column Cash Book and Petty Cash Book(Problems only on Three Column Cash Book and Petty Cash Book), Bank Reconciliation Statement – Preparation of Bank Reconciliation Statement (Problems on BRS)

Module No. 4	FINAL ACCOUNTS OF PROPRIETARY CONCERN	10

Preparation of Statement of Profit and Loss and Balance Sheet of a proprietary concern with special adjustments like depreciation, outstanding and prepaid expenses, outstanding and received in advance of incomes, provision for doubtful debts, drawings and interest on capital.

Module No. 5	ACCOUNTING SOFTWARE	12

Introduction–meaning of accounting software, types accounting software–accounting software Tally-Meaning of Tally software – Features – Advantages, Creating a New Company, Basic Currency information, other information, Company features and Inventory features. Configuring Tally - General Configuration, Numerical symbols, accounts/inventory info – master configuration - voucher entry configuration. Working in Tally: Groups, Ledgers, writing voucher, different types of voucher, voucher entry Problem on Voucher entry - Generating Basic Reports in Tally-Trail Balance, Accounts books, Cash Book, Bank Books, Ledger Accounts, Group Summary, Sales Register and Purchase Register, Journal Register, Statement of Accounts, and Balance Sheet.

SKILL DEVELOPMENTS ACTIVITIES

- List out the accounting concepts and conventions.
- Prepare a Bank Reconciliation Statement with imaginary figures
- Collect the financial statement of a proprietary concern and record it.
- Prepare a financial statement of an imaginary company using tally software.

TEXT BOOKS

- Hanif and Mukherjee, Financial Accounting, Mc Graw Hill Publishers
- Arulanandam & Raman; Advanced Accountancy, Himalaya Publishing House
- S.Anil Kumar,V.Rajesh Kumar and B.Mariyappa–Fundamentals of Accounting,
- Himalaya Publishing House.
- Dr. S.N. Maheswari, Financial Accounting, Vikas Publication
- S P Jain and K. L. Narang, Financial Accounting, Kalyani Publication
- Radhaswamy and R.L. Gupta, Advanced Accounting , Sultan Chand
- M.C. Shukla and Goyel, Advaced Accounting, S Chand.

NOTE: LATEST EDITION OF TEXT BOOKS MAY BE USED.

Subject Name		MARKETING MANAGEMENT		Subject Code		BBA 1.3
Course Credits	4	No. of Hours per Week	4	Total No. of Teaching Hours		56

PEDAGOGY:
Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

COURSE OUTCOMES:
On successful completion of the course, the Students will demonstrate

- Understand the concepts and functions of marketing.
- Analyse marketing environment impacting the business.
- Segment the market and understand the consumer behaviour
- Describe the 4 p's of marketing and also strategize marketing mix
- Describe p's of service marketing mix.

MODULE NO. 1	INTRODUCTION TO MARKETING	10

Meaning and Definition, Concepts of Marketing, Approaches to Marketing, Functions of Marketing. Recent trends in Marketing-E- business, Tele-marketing, M-Business, Green Marketing, Relationship Marketing, Concept Marketing, Digital Marketing, social media marketing and E-tailing (Meaning only).

MODULE NO. 2	MARKETING ENVIRONMENT	10

Micro Environment – The company, suppliers, marketing intermediaries competitors, public and customers; Macro Environment- Demographic, Economic, Natural, Technological, Political, Legal, Socio-Cultural Environment.

MODULE NO. 3	MARKET SEGMENTATION AND CONSUMER BEHAVIOUR	10

Meaning and Definition, Bases of Market Segmentation, Requisites of Sound Market Segmentation; Consumer Behavior-Factors influencing Consumer Behavior; Buying Decision Process.

MODULE NO. 4	MARKETING MIX	20

Meaning, Elements of Marketing Mix (Four P's) – Product, Price, Place, Promotion. Product-Product Mix, Product Line, Product Lifecycle, New Product Development, Reasons for Failure of New Product, Branding, Packing and Packaging, Labeling, Pricing – Objectives, Factors influencing Pricing Policy, Methods of Pricing; Physical Distribution–Meaning, Factors affecting Channel Selection, Types of Marketing Channels. Promotion – Meaning and Significance of Promotion, Personal Selling and Advertising (Meaning Only)

MODULE NO. 5	SERVICES MARKETING	06

Meaning and definition of services, difference between goods and services, features of services, seven P's of services marketing (concepts only).

SKILL DEVELOPMENTS ACTIVITIES

- Two cases on the above syllabus should be analyzed and recorded in the skill development
- Design a logo and tagline for a product of your choice

- Develop an advertisement copy for a product.
- Prepare a chart for distribution network for different products.

TEXT & REFERENCE BOOKS

- Philip Kotler, Marketing Management, Prentice Hall.
- Lovelock Christopher, Services Marketing: People, Technology, Strategy, PHI
- William J. Stanton, Michael J.Etzel, Bruce J Walker, Fundamentals of Marketing, McGraw Hill Education.
- Bose Biplab, Marketing Management, Himalaya Publishers.
- J.C. Gandhi, Marketing Management, Tata McGraw Hill.
- Ramesh and Jayanti Prasad: Marketing Management, I.K. International
- Sontakki, Marketing Management, Kalyani Publishers.
- P N Reddy and Appanniah, Marketing Management

NOTE: LATEST EDITION OF TEXT BOOKS MAY BE USED.

Subject Name		DIGITAL MARKETING		Subject Code		BBA 1.4 (OEC)
Course Credits	3	No. of Hours per Week	3	Total No. of Teaching Hours		45

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES
On successful completion of the course, the Students will be able to

- Understand the basic Work in Word effectively.
- Effectively communicate through Email
- Concepts of Spreadsheet
- Summarize data using Functions
- Apply Conditions using formulas and Functions
- Implement Basic financial Concepts in Spreadsheet

MODULE NO. 1	WORD DOCUMENT	16 HRS

Introduction – Objective –Word Document Basic - Opening Word Document Package – Title Bar, Menu Bar, – Toolbars & Sidebar – Creating a New Document – Opening and Closing Documents Opening Documents – Save and Save As – Closing Document – Using The Help – Page Setup – Print Preview – Printing of Documents – PDF file and Saving a Document as PDF file – Document manipulation & Formatting – Text Selection – Cut, Copy and Paste – Font, Color, Style and Size selection – Alignment of Text – Undo & Redo – Spelling & Grammar – Shortcut Keys

MODULE NO. 2	INTERNET & EMAIL	04 HRS

Introduction – Objectives – Internet - protocols: HTTP, HTTPS, FTP – Concept of Internet & WWW – Website Address and URL – Applications of Internet – Modes of Connecting Internet (Hotspot, Wi-Fi, LAN Cable, Broadband, USB Tethering) – Popular Web Browsers (Internet Explorer/Edge, Chrome, Mozilla Firefox,) – Exploring the Internet – Surfing the web – Popular Search Engines – Searching on Internet – Introduction -Objectives - Structure – protocols: SMTP, IMAP, POP3 – Opening Email account – Mailbox: Inbox and Outbox – Creating and Sending a new E-mail – CC – BCC– Replying –Mail MergeForwarding – attachments – Scheduling – Password Protect – Delete.

MODULE NO. 3	INTRODUCTION TO SPREADSHEETS	04 HRS

Introduction to spreadsheets - Office Suite overview - Basic text and cell formatting – Basic arithmetic calculation - Special paste - Freeze pane - Auto completion of series – Sort and filter - Charts.

MODULE NO. 4	SUMMARIZING DATA USING FUNCTIONS	12 HRS

Perform calculations by using the SUM function– Perform calculations by using MIN and MAX functions - Perform calculations by using the COUNT function - Perform calculations by using the AVERAGE function - Perform logical operations by using the IF function – Perform logical operations by using the SUMIF function - Perform logical operations by using the AVERAGEIF function - Perform statistical operations by using the COUNTIF function.

MODULE NO. 5	DATA VALIDATION	09 HRS

Text Functions: LEN, TRIM, PROPER, UPPER, LOWER, CONCATENATE. Skill Developments Activities: ● Enter class data into rows and columns ● Create Draft Marks Card in Spreadsheet ● Create Draft profit and Loss and Balance Sheet in Spreadsheet ● Create GST Invoice in Spreadsheet with Tax Rate Any other activities, which are relevant to the course.

SKILL DEVELOPMENTS ACTIVITIES

- Use word processor to prepare Resume
- Draft a covering letter using Word Processor
- Systematically draft different emails
- Prepare a Letter of Internship requisition and send email.
- Enter class data into rows and columns
- Create Draft Marks Card in Spreadsheet
- Create Draft profit and Loss and Balance Sheet in Spreadsheet
- Create GST Invoice in Spreadsheet with Tax Rate
- Any other activities, which are relevant to the course.

TEXT & REFERENCE BOOKS

- Learning MS-Word and MS-Excel, by Rohit Khurana
- Excel Formulas and Functions 2020: The Step by Step Excel Guide with Examples on How to Create Powerful Formulas: 1 by Adam Ramirez
- Excel 2013 in Simple Steps by Kogent Learning Solutions Inc.
- Excel Formulas and Functions: The Step by Step Excel Guide on how to Create Powerful Formulas by Harjit Suman

Subject Name	Business Management		Subject Code	BBA 1.5 (OEC)
Course Credits	3	No. of Hours per Week	3	Total No. of Teaching Hours	42

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES
On successful completion of the course, the Students will be able to

- An understanding of the nature, objectives and social responsibilities of business
- An ability to describe the different forms of organisations
- An understanding of the basic concepts of management
- An understanding of functions of management.
- An understanding of different types of business combinations

MODULE NO. 1	INTRODUCTION TO BUSINESS	08

Business: Meaning, Nature, Scope and Social responsibility of Business, Objectives, Essentials of successful business; Functional areas of business. Concept of Business Organisation.

MODULE NO. 2	FORMS OF BUSINESS ORGANIZATION	12

Sole proprietorship: Definitions, Features, Merits and Demerits. Partnership: Definitions, partnership deed, Features, Merits and Demerits. Joint Stock Company: Definitions, Features, Merits and Demerits. Co-operatives: Definitions, Features, Merits and Demerits.

MODULE NO. 3	PUBLIC ENTERPRISES	08 HRS

Departmental Undertaking: Definitions, Features, Merits and Demerits. Public Corporations: Definitions, Features, Merits and Demerits. Government Companies: Definitions, Features, Merits and Demerits

MODULE NO. 4	BUSINESS FUNCTIONS	08 HRS

Functional Areas of Management Marketing Management: Marketing Concept; Marketing Mix; Product Life Cycle; Pricing Policies and Practices Financial Management: Concept and Objectives; Sources of Funds – Equity Shares, Debentures, Venture Capital and Lease Finance. Securities Market, Role of SEBI. Human Resource Management: Concept and Functions; Basic Dynamics of Employer – Employee Relations.

MODULE NO. 5	MANAGEMENT OF ORGANIZATIONS	06 HRS

Management– Meaning, Definitions, Difference between Management and Administration, Levels of Management, Objectives of Management, Functions of management- planning, organizing, staffing, directing, coordinating, controlling, Principles of Management.

SKILL DEVELOPMENTS ACTIVITIES

- Preparation of partnership deed
- Draw a business tree
- Make a list of 10 PSUs
- Prepare a list of different types of business combinations
- Prepare an Organization chart

TEXT & REFERENCE BOOKS

- C B. Guptha – Business Organisation and Management, Sultan Chand & Sons.
- Dr. S. C. Saxena – Business Administration & Management, Sahitya Bhawan.
- M. C. Shukla – Business Organisation and Management. S Chand & Company Pvt. Ltd.
- S.A Sherlekar – Business Organization, Himalaya Publishing House.
- Y.K. Bhushan. Fundamentals of Business Organisation and Management, Sultan Chand & Sons.
- R.K. Sharma, Business Organisation & Management Kalyani Publishers
- Dr. I.M. Sahai, Dr. Padmakar Asthana,' Business Organisation & Administration', Sahitya Bhawan Publications Agra.

NOTE: LATEST EDITION OF TEXT BOOKS MAY BE USED.

Subject Name	OFFICE MANAGEMENT (OEC)		Subject Code		BBA 1.5
Course Credits	3	No. of Hours per Week	3	Total No. of Teaching Hours	42

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES
On successful completion of the course, the Students will be able to

- An understanding of basic knowledge of office organisation and management
- Demonstrate skills in effective office organization
- Ability to maintain office records
- Ability to maintain digital record.
- Understanding of different types of organisation structures and responsibilities as future office managers.

MODULE NO. 1	FUNDAMENTALS OF OFFICE MANAGEMENT	06

Introduction: Meaning, importance and functions of modern office, Modern Office Organisation: Meaning; Steps in office organisation; Principles of Office organisation, Organisation structure types, Nature of office services: Types of services in a modern office, decentralization and centralization of office services, Departmentation of Office Office management: Meaning, Elements and major processes of Office management Office Manager: Functions and qualifications of Office manager.

MODULE NO. 2	ADMINISTRATIVE ARRANGEMENT AND FACILITIES	06

Office Accommodation and its Importance: Location of Office, Choice of Location: Urban vs Suburban, Factors to be Considered in Selecting the Site, Securing Office Space, Office Lay-out: Objectives of Office Lay-out, Principles of Office Lay-out, Steps in Lay-out Planning, Advantages of a Good Lay-out. Types of offices: Open Office and Private Office- advantages and disadvantages.

MODULE NO. 3	OFFICE ENVIRONMENT	10 HRS

Meaning and Components of Office Environment, Interior Decoration: Colour conditioning, Floor Coverings, Furnishings, Furniture and Fixtures: Types of Furniture, Choice between Wooden and Steel Furniture, Principles Governing Selection of Furniture Lighting and Ventilation, Noise: Internal Noise, External Noise, Cleanliness, Sanitation and Health, Safety and Security

MODULE NO. 4	RECORDS MANAGEMENT	10 HRS

Module No. 4: Introduction to records: Importance of Records, types of office records, Records Management: Meaning, Principles of Record Keeping, Functions of 'Records Management Filing: Elements of Filing and Filing Functions, Objectives and Importance of Filing, Advantages of Filing, Essentials of a Good Filing System, Classification of Files, Filing Procedure or Routine. Filing Methods: Horizontal Filing – meaning, types and advantages, Vertical Filing– meaning, equipment used, advantage and disadvantages. Centralisation and Decentralisation of Filing– Centralised filing and Decentralised Filing Office manual: contents, Importance, types of office manuals. Indexing: Meaning, importance, advantages and essentials of good indexing, type of index Retention and disposal of files: Meaning and benefits of record retention, need for disposal of files, life-cycle stages of files.

MODULE NO. 5	OFFICE MECHANISATION AND DATA PROCESSING	10 HRS

Meaning, Importance and Objectives of Office Mechanisation, Advantages and disadvantages of Office Mechanisation, Factors Determining Office Mechanisation Kinds of Office Machines: Duplicating Machines and Photocopying Machines, Accounting, tabulating and computing machines, communication machines, Introduction to Data and Information: Distinction between Data and Information, Importance of Data and Information, Classification of Data, Classification of Information, Data Lifecycle (chart), Data Collection Methods– Primary and secondary data collection methods, Data presentation Methods of Presentation of Data, Data processing using computers: Components of Computers, Input and Output Devices, Software used in Computers (names and uses only), Computer Applications in Office Management, Advantages and Limitations of Computerisation

SKILL DEVELOPMENTS ACTIVITIES

- Visit an office and enlist the different types of machines used in the office
- Identify the different types of stationery used in offices today
- Draw a data life cycle chart
- Draw charts indicating different types of office layouts.

TEXT & REFERENCE BOOKS

- S.P Arora, Office Organisation and Management, Vikas Publishing House Pvt Ltd
- M.E Thakuram Rao, Office organisation and Management, Atlantic
- Judith Read, Mary Lea Ginn, Record Management, 10th Edition, Cengage Learning.

NOTE: LATEST EDITION OF TEXT BOOKS MAY BE USED.

Subject Name	RETAIL MANAGEMENT (OEC)		Subject Code	BBA 1.5
Course Credits	3	No. of Hours per Week	3	Total No. of Teaching Hours	42

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES
On successful completion of the course, the Students will be able to
• An understanding of basic knowledge of Retail organisation and management • Demonstrate skills in effective Retail organisation • Ability to maintain office records • Ability to understand digitalization of retailing. • Understanding of different types of Retailing

MODULE NO. 1	RETAIL THEORY & PRACTICES RETAIL	

Nature, Scope, History, Retail Institutions, Types, Retail Management Process, Indian Retailing Scenario, Retail Managers – Roles, Skills and Scope, Evolution of Management Theory, Organizational Environment in Retail Sector, Ethical Issues in Retailing Job Opportunities in Retail Industry– Personality Traits of Retailers, Retail Entrepreneur, Employment Opportunities, Internationalization and Globalization of Retailing.

MODULE NO. 2	RETAIL MARKETING STRATEGY	

Introduction, Building Retail Brand, Sales Enhancement Strategies, Business Intelligence, Customer Service, Social Media Marketing, Pricing Strategy, Point of purchase communication, Role of Packaging, Pricing Strategy, Merchandise Management, Private Labels, Retail Promotion, Building Store Loyalty

MODULE NO. 3	RETAIL ORGANIZATION & FUNCTIONAL MANAGEMENT	

Introduction, Classification of Retail Organization, Franchising, Human Resource Management in Retail, Building and Sustaining Relationship in Retailing, Customer relationship Management,

MODULE NO. 4	STORE PLANNING	

Location, Layout, Store Operations: POS (Point of Sale) /Cash Process, Customer Service and Accommodation, Retail Floor and Shelf Management, Retail Accounting and Cash Management, Setting up Stores before Opening, Working with Floor Plans and Store Requirements

MODULE NO. 5	ELECTRONIC RETAILING	

Introduction, Types of Technology in Retailing, Role of IT in Business; Influencing Parameters for use of IT in Retailing; Efficiency in Operations, Effective Management of Online catalogues; Direct Retailing Methods, Database Management; Data warehousing; Critical Analysis of E-Retailing Strategies; Customer Relationship Management

SKILL DEVELOPMENTS ACTIVITIES

• Draw a retail organization chart
• Classify different types of retailers
• Conduct a customer satisfaction survey

- Do a SWOC Analysis of a retail organisation

TEXT & REFERENCE BOOKS

- Levy Michael,Weitz Barton – Retailing Management, V Edition, Tata McGraw Hill, New York, 2. Berman Berry, Evans J.R.– Retail Management– A Strategic Management Approach, IX Edition , Pearson Education, New York,
- Lucas G.H., Bush Robert, Gresham Larry– Retailing, Houghton Mifflin Company, Boston
- Pradhan Swapna– Retailing Management-Text and Cases, II Edition, Tata Mc Graw Hill, India,
- Sinha, Uniyal– Managing Retailing, Oxford University Press, Delhi
- Agarwal, Bansal, Yadav, Kumar– Retail Management, Pragati Prakashan, Meerut
- Berman Berry, Evans J.R.– Retail Management– A Strategic Management Approach, IX Edition , Pearson Education, New York,
- Pradhan Swapna– Retailing Management-Text and Cases, II Edition, Tata Mc Graw Hill

Subject Name	FINANCIAL ACCOUNTING AND REPORTING		Subject Code		BBA 2.1
Course Credits	4	No. of Hours per Week	4	Total No. of Teaching Hours	56

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES
On successful completion of the course, the Students will be able to

- The ability to prepare final accounts of partnership firms
- The ability to understand the process of public issue of shares and accounting for the same
- The ability to prepare final accounts of joint stock companies.
- The ability to prepare and evaluate vertical and horizontal analysis of financial statements
- The ability to understand company's annual reports.

MODULE NO. 1	FINAL ACCOUNTS OF PARTNERSHIP FIRM	10

Meaning of Partnership Firm, Partnership deed-clauses in partnership deed, Preparation of Final accounts of partnership firm-Trading and Profit and Loss Account, Profit and Loss Appropriation Account, Partners capital account and Balance sheet. Goodwill- Nature, Factors influencing goodwill and methods of valuation of goodwill (Average and super profit methods)

MODULE NO. 2	ISSUE OF SHARES	08

Meaning of Share, Types of Shares – Preference shares and Equity shares – Issue of Shares at par, at Premium, at Discount: Pro-Rata Allotment; Journal Entries relating to issue of shares; Preparation of respective ledger accounts; Preparation of Balance Sheet in the Vertical form (Practical Problems).

MODULE NO. 3	FINAL ACCOUNTS OF JOINT STOCK COMPANIES	12 HRS

Statutory Provisions regarding preparation of Company Final Accounts – Treatment of Special Items, Managerial Remuneration, Tax deducted at source, Advance payment of Tax, Provision for Tax, Depreciation, Interest on debentures, Dividends, Rules regarding payment of dividends, Transfer to Reserves, Preparation of Profit and Loss Account and Balance Sheet (Vertical Form Schedule -III) (Practical Problems).

MODULE NO. 4	FINANCIAL STATEMENTS ANALYSIS	12 HRS

Comparative Statements - Comparative Income Statement, Comparative Balance Sheet; Common size Statements – Common Size Income Statement, Common Size Balance Sheet – Trend Percentages. (Analysis and Interpretation)

MODULE NO. 5	CORPORATE FINANCIAL REPORTING	10 HRS

Corporate Financial Reporting – meaning, types, characteristics of Corporate financial report, users of corporate financial report; Components corporate financial report– general corporate information, financial highlights, letter to the shareholders from the CEO, management's discussion and analysis; Financial Statements–balance sheet, income statement, cash flow statement, and notes to the financial statements; Auditor's report;

Significant Accounting Policies; Corporate Governance Report; Corporate Social Responsibility Report (Discuss only), Role and Significance of above components of corporate financial report).

SKILL DEVELOPMENTS ACTIVITIES

- Collect financial statement of a company for five years and analyse the same using trend analysis.
- Refer annual reports of two companies and list out the components.
- Draft a partnership deed as per Partnership Act.
- List out the accounting policies in annual report of the company

TEXT & REFERENCE BOOKS

- Stephen P. Robbins, Management, Pearson
- Koontz and O"Donnell, Management, McGraw Hill.
- L M Prasad, Principles of management, Sultan Chand and Sons
- V.S.P Rao/Bajaj, Management process and organization, Excel Books.GH25
- Appanniah and Reddy, Management, HPH.
- T. Ramaswamy : Principles of Management, HPH.

NOTE: LATEST EDITION OF TEXT BOOKS MAY BE USED.

Subject Name	HUMAN RESOURCE MANAGEMENT		Subject Code	BBA 2.2
Course Credits	4	No. of Hours per Week	4	Total No. of Teaching Hours	56

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES *On successful completion of the course, the Students will be able to*
• Ability to describe the role and responsibility of Human resources management functions on business • Ability to describe HRP, Recruitment and Selection process • Ability to describe to induction, training, and compensation aspects. • Ability to explain performance appraisal and its process. • Ability to demonstrate Employee Engagement and Psychological Contract.

MODULE NO. 1	INTRODUCTION TO HUMAN RESOURCE MANAGEMENT	10 HRS

Meaning and Definition of HRM – Features Objectives, Differences between Human Resource Management and Personnel Management, Importance, Functions and Process of HRM, Role of HR Manager, Trends influencing HR practices

MODULE NO. 2	HUMAN RESOURCE PLANNING, RECRUITMENT & SELECTION	14 HRS

Human Resource Planning: Meaning and Importance of Human Resource Planning, Process of HRP, HR Demand Forecasting– Meaning and Techniques (Meanings Only) and HR supply forecasting, Succession Planning – Meaning and Features, Job Analysis: Meaning and Uses of Job Analysis, Process of Job Analysis – Job Description, Job Specification, Job Enlargement, Job Rotation, Job Enrichment (Meanings Only) Recruitment – Meaning, Methods of Recruitment, Factors affecting Recruitment, Sources of Recruitment, Selection – Meaning, Steps in Selection Process, Psychometric tests for Selection, Barriers to effective Selection, Making Selection effective; Placement, Gamification – Meaning and Features

MODULE NO. 3	INDUCTION, TRAINING AND COMPENSATION	10 HRS

Induction: Meaning, Objectives and Purpose of Induction, Problems faced during Induction, Induction Program Planning. Training: Need for training, Benefits of training, Assessment of Training Needs and Methods of Training and Development; Kirkpatrick Model; Career Development. Compensation: Direct and Indirect forms of Compensation (Meaning Only), Compensation Structure.

MODULE NO. 4	PERFORMANCE APPRAISAL, PROMOTION & TRANSFERS	14 HRS

Performance appraisal: Meaning and Definition, Objectives and Methods of Performance Appraisal – Uses and Limitations of Performance Appraisal, Process of Performance Appraisal Promotion: Meaning and Definition of Promotion, Purpose of Promotion, Basis of promotion Transfer: Meaning of Transfer, Reasons for Transfer, Types of Transfer, Right Sizing of Work Force, Need for Right Sizing

MODULE NO. 5	EMPLOYEE ENGAGEMENT AND PSYCHOLOGICAL CONTRACT	08 HRS

Employee Engagement (EE): Meaning and Types of EE, Drivers of Engagement – Measurement of EE, Benefits of EE. Psychological contract: Meaning and features

SKILL DEVELOPMENTS ACTIVITIES

- Preparation of Job Descriptions and Job specifications for a Job profile
- Choose any MNC and present your observations on training program
- Develop a format for performance appraisal of an employee.
- Discussion of any two Employee Engagement models.
- Analysis of components of pay structure based on the CTC sent by the Corporate to the institute for the various jobs of different sectors.

TEXT & REFERENCE BOOKS

- Aswathappa, Human Resource Management, McGraw Hill Edwin Flippo, Personnel Management, McGraw Hill C.B.Mamoria, Personnel Management, HPH
- Subba Rao, Personnel and Human Resources Management, HPH Reddy & Appanniah, Human Resource Management, HPH Madhurimalal, Human Resource Management, HPH
- S.Sadri & Others: Geometry of HR, HPH Rajkumar: Human Resource Management I.K. Intl
- Michael Porter, HRM and Human Relations, Juta & Co.Ltd.
- K. Venkataramana, Human Resource Management, SHBP Chartered Accountants of India, New Delhi.

NOTE: LATEST EDITION OF TEXTBOOKS MAY BE USED.

Subject Name		BUMASTICS		Subject Code		BBA 2.3
Course Credits	4	No. of Hours per Week	4	Total No. of Teaching Hours		56

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES
On successful completion of the course, the Students will be able to
• The Understanding of the basic concepts of business maths and apply them to create solve and interpret application problems in business • Ability to solve problems on various types of equation. • Ability to solve problems on Matrices and execute the laws of indices, law of logarithm and evaluate them. • Ability to apply the concept of simple interest and compound interest bills discounted, calculate Correlation and Regression for situations • Ability to solve problems on Arithmetic progression, Geometric progression and • construct logical application of these concepts.

MODULE NO. 1	THEORY OF EQUATIONS	10 HRS

Introduction business mathematics and its importance – Equations - Meaning - Types of Equations – Simple/ Linear Equations and Simultaneous Equations (only two variables), Elimination and Substitution Methods only. Quadratic Equation - Factorization and Formula Method ($ax^2 + bx + c = 0$ form only). Simple problems.

MODULE NO. 2	INDICIES, MATRICES AND LOGARITHMS	16 HRS

Meaning – types – operation on matrices – additions – subtractions and multiplication of two matrices – transpose – determinants – minor of an element – co-factor of an element – inverse – crammers rule in two variables – problems. Indices and Logarithms: Meaning- Basic Laws of Indices and their application for simplification. Laws of Logarithms – Common Logarithm, Application of Log Table for Simplification.

MODULE NO. 3	COMMERCIAL ARITHMETIC	16 HRS

Simple Interest, Compound Interest including yearly and half yearly calculations, Annuities, Percentages, Bills Discounting, Ratios and proportions, duplicate-triplicate and sub- duplicate of a ratio. Proportions: third, fourth and inverse proportion - problems.

MODULE NO. 4	BUSINESS STATISTICS	12 HRS

Meaning and importance Measures of central tendency – Mean, Median, Mode, G.M. and H.M. Dispersion – Range – Q.D. – M.D. – S.D. – C.V.

MODULE NO. 5	BUSINESS STATISTICS – 2	09 HRS

Simple Correlation and Regression

SKILL DEVELOPMENTS ACTIVITIES
• Develop an Amortization Table for Loan Amount – EMI Calculation. • Secondary overhead distribution summary using Simultaneous Equations Method.

- Application of Matrix In Business Problems
- Application of Correlation and Regression

TEXT & REFERENCE BOOKS

- Saha: Mathematics for Cost Accountants, Central Publishers
- R.G. Saha and Others – Methods and Techniques for Business Decisions, VBH
- Dr. SanchetiandKapoor: Business Mathematics and Statistics, Sultan Chand
- Zamarudeen: Business Mathematics, Vikas
- R.S Bhardwaj :Mathematics for Economics and Business
- Madappa, mahadi Hassan, M. IqbalTaiyab – Business Mathematics, Subhash
- G.R. Veena and Seema : Business Mathematics and Statistics I.K. Intl Publishers
- Guptha Statistical methods

NOTE: LATEST EDITION OF TEXT BOOKS MAY BE USED.

Subject Name	PEOPLE MANAGEMENT		Subject Code	BBA.2.6 (OEC)
Course Credits	3	No. of Hours per Week	3	Total No. of Teaching Hours	45

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES
On successful completion of the course, the Students will be able to

- Ability to examine the difference between People Management with Human resource Management
- Ability to explain the need for and importance of People Management.
- Ability to explain role of manager in different stages of performance management process
- Ability to list modern methods of performance and task assessment.
- Ability to analyse the factors influencing the work life balance of an working individual.

MODULE NO. 1	INTRODUCTION TO PEOPLE MANAGEMENT	06 HRS

Diversity in organisation: age, gender, ethnicity, race, and ability. People Management: Meaning, Features, Significance of people management, Difference between People Management and Human Resource Management, impact of individual and organizational factors on people management.

MODULE NO. 2	GETTING WORK DONE AND ASSESSMENT AND EVALUATION	12 HRS

Getting work done: Challenges of getting work done, significance of prioritization and assigning work to team members. Performance Management: meaning, role of a manager in the different stages of the performance management process, Types of Performance assessment, Assessment and Evaluation Process of evaluation of tasks in the organisation. Modern tools of assessment and evaluation of tasks and performance.

MODULE NO. 3	BUILDING PEER NETWORKS AND ESSENTIALS OF COMMUNICATION	12 HRS

Building Peer Networks: Understanding the importance of peer networks in an organization; being able to influence those on whom you have no authority; challenges Peer networking and different types of people networking in the workplace. Essentials of Communication: Concept of the communication process with reflection on various barriers to effective communication and ways to overcome, Types of Communication and Channels of Communication.

MODULE NO. 4	MOTIVATION	08 HRS

Meaning, Importance and need for motivation, team motivation– meaning, importance team motivation, types of Motivators and Modern methods of motivation

MODULE NO. 5	MANAGING SELF	07 HRS

Reflection on what does it mean to be a people manager; building a personal development plan for oneself, Self-Stress Management: Causes for stress, work life Balance, Importance of Work life balance, Factors influencing Work life Balance.

SKILL DEVELOPMENTS ACTIVITIES

- Analyse two cases on any of the above content indicated above.
- List out the modern tools to performance assessment and evaluation.
- Conduct a survey of work life balance of working individuals
- Draft a Career development of working individual in the middle level management.

TEXT & REFERENCE BOOKS

- McShane, Steven L. and Mary Ann Von Glinow, Organizational Behavior: Emerging Knowledge and Practice for the Real World. McGraw-Hill, latest edition, ISBN: 0-07-115113-3.
- Bernardin, H. John and Joyce E. A. Russell. Human Resource Management: An Experiential Approach. McGraw-Hill, 6/e. ISBN: 0078029163
- Argyris, C. (1974). Personality vs. Organization. Organizational Dynamics. Vol. 3. No. 2, Autumn.
- Blume, B. Baldwin, T. and Ryan, K. (2013). Communication Apprehension. A barrier to students leadership, adaptability and multicultural appreciation. Academy of Management Learning & Education, Jun, Vol. 12 Issue 2, p158-172.
- Colquitt, J.A., LePine, J.A., & Wesson, M.J. (2009) Organizational Behavior: Improving Performance and Commitment in the Workplace (International edition). New York: McGraw-Hill.
- Goleman, D. (1998). Working with Emotional Intelligence. Bantam Books

NOTE: LATEST EDITION OF TEXT BOOKS MAY BE USED.

Subject Name	DIGITAL MARKETING		Subject Code	BBA 2.6 (OEC)
Course Credits	3	No. of Hours per Week	3	Total No. of Teaching Hours	45

PEDAGOGY
Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

COURSE OUTCOMES
On successful completion of the course, the Students will be able to

Demonstrate the importance of the digital marketing for marketing success, manage customer relationships across all digital channels and build better customer relationships, create a digital marketing plan, starting from the SWOT analysis and defining a target group, then identifying digital channels, their advantages and limitations, perceiving ways of their integration taking into consideration the available budget

MODULE NO. 1	BASICS OF DIGITAL MARKETING	09 HRS

– Marketing, advertisement, history of the internet and digital advertisements, social media, digital marketing, algorithms, visibility, engagement, traffic, inbound – outbound marketing, digital marketing vs traditional marketing.

MODULE NO. 2	CONTENT CREATION FOR ONLINE PLATFORMS	09 HRS

Types of content: written, audio, picture, video; content and marketing, optimising content for web and for social media, influencers, connecting with influencers, headlines and data. Practical: audio-video production.

MODULE NO. 3	WEB MARKETING	09 HRS

web development with WordPress/Vix CMS, domain name, server, hosting, plugin, Google AdSense, Google trends, blogging – content writing, Adwords, keyword planner, Search Engine Optimization, off-page optimization, backlink, Google Analytics, competitor and website analysis, keyword analysis, cookies, page ranking, domain authority.

MODULE NO. 4	SOCIAL MEDIA MARKETING	09 HRS

Social media marketing, optimization, social media analytics, product marketing in Google Ads, Instagram, Facebook, YouTube video marketing, Twitter campaign, LinkedIn campaign, remarketing; App Store Optimization.

MODULE NO. 5	FREELANCING	09 HRS

Freelancing – guidance to Google, Microsoft Bing, email marketing, affiliate marketing, mobile marketing, digital marketing automation.

SKILL DEVELOPMENTS ACTIVITIES

- Define a target group (working in groups)
- Creating web sites, MS Expression (working in groups)
- Google AdWords (working in groups
- CRM strategy (working in groups)
- Social Media Marketing plan (working in groups)
- Making a Facebook page (working in groups)
- Business opportunities and Instagram options

- Optimization of Instagram profiles
- Integrating Instagram with a Web Site and other social networks
- Keeping up with posts

TEXT & REFERENCE BOOKS

- Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.
- The Beginner's Guide to Digital Marketing
- Digital Marketer. Pulizzi,J.(2014) Epic Content Marketing, Mcgraw Hill Education.
- Chaffey, D., & Smith, P. R. (2017). Digital marketing excellence: planning, optimizing
- and integrating online marketing. Routledge.
- Chaffey, D., & Ellis-Chadwick, F. (2019). Digital marketing. Pearson.
- Charlesworth, A. (2018). Digital marketing: A practical approach. Routledge.
- Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.
- Gupta, S. (2018). Digital marketing. McGraw-Hill Education.
- Hanlon, A. (2018). Digital marketing: Strategic planning & integration. Sage.
- Parkin, G. (2016). Digital marketing: Strategies for online success. Fox Chapel Publishing.

ಬೆಂಗಳೂರು ಉತ್ತರ ವಿಶ್ವವಿದ್ಯಾಲಯ

ಟಮಕ, ಕೋಲಾರ – 563103

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: BACHELOR OF COMPUTER APPLICATION

2021-22 onwards

BENGALURU NORTH UNIVERSITY
KOLAR - 563103

National Education Policy - 2020
(Semester Scheme)

Model Curriculum Structure for Bachelor of Computer
Applications (BCA) Programme
(Basic and Honours degree)

Model Syllabus for 1st and 2nd Semesters
and
Open Elective Courses in Computer Science.

Revised w.e.f.

Academic Year 2021 - 2022 and onwards

Preamble

Computer Application (CA) has been evolving as an important branch of science and technology in last two decade and it has carved out a space for itself like computer science and engineering. Computer application spans theory and more application and it requires thinking both in abstract terms and in concrete terms.

The ever -evolving discipline of computer application has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers and its applications, but finding a solution requires both computer science expertise and knowledge of the particular application domain.

Computer science has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Mathematical and Statistical Analysis, Data Science, Computational Science, and Software Engineering.

Universities and other HEIs introduced programmes of computer application. Information Technology is growing rapidly. Increasing applications of computers in almost all areas of human endeavour has led to vibrant industries with concurrent rapid change in technology. Unlike other basic disciplines, developing core competency in this discipline that can be reasonably stable becomes a challenge.

In India, it was initially introduced at the Master (postgraduate) level as MCA and M.Tech. Later on, engineering programmes such as B.Tech and B.E in Computer Science & Engineering and in Information Technology were introduced in various engineering College/Institutions to cater to the growing demand for trained engineering manpower in IT industries. Parallelly, BCA, BSc and MSc programmes with specialisation in Computer Science were introduced to train manpower in this highly demanding area.

BCA and BCA (Hons) are aimed at undergraduate level training facilitating multiple career paths. Students so graduated, can take up postgraduate programmes in CS or MCA leading to research as well as R&D, can be employable at IT industries, or can pursue a teaching profession or can adopt a business management career.

BCA and BCA (Hons) aims at laying a strong foundation of computer application at an early stage of the career. There are several employment opportunities and after successful completion of BCA, graduating students can fetch employment directly in companies as programmer, Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel.

The Program outcomes in BCA are aimed at allowing flexibility and innovation in design and development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in BCA courses, in outcome-based curriculum framework, help students learn solving problems, accomplishing IT tasks, and expressing creativity, both individually and collaboratively. The proposed framework will help Students learn programming techniques and the syntax of one or more programming languages.

All students must, therefore, have access to a computer with a modern programming language installed. The computer science framework does not prescribe a specific language. The teacher and students will decide which modern programming languages students will learn. More importantly, students will learn to adapt to changes in programming languages and learn new languages as they are developed.

The present Curriculum Framework for BCA degrees is intended to facilitate the students to achieve the following.

- To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation

- To develop the ability to use this knowledge to analyse new situations in the application domain

- To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.

- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems

- To learn skills and tools like mathematics, statistics and electronics to find the solution, interpret the results and make predictions for the future developments

- To formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate

The objectives of the Programme are:

1. The primary objective of this program is to provide a foundation of computing principles and business practices for effectively using/managing information systems and enterprise software

2. It helps students analyze the requirements for system development and exposes students to business software and information systems

3. This course provides students with options to specialize in legacy application software, system software or mobile applications

4. To produce outstanding IT professionals who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves

5. To provide opportunity for the study of modern methods of information processing and its applications.

6. To develop among students the programming techniques and the problem-solving skills through programming

7. To prepare students who wish to go on to further studies in computer science and related subjects.

8. To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications

Program Outcomes: **BCA** (3 Years) **Degree**

1. **Discipline knowledge:** Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity

2. **Problem Solving:** Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.

3. **Design and Development of Solutions:** Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.

4. **Programming a computer:** Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.

5. **Application Systems Knowledge**: Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.

6. **Modern Tool Usage:** Identify, select and use a modern scientific and IT tool or technique for modeling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.

7. **Communication:** Must have a reasonably good communication knowledge both in oral and writing.

8. **Project Management:** Practicing of existing projects and becoming independent to launch own project by identifying a gap in solutions.

9. **Ethics on Profession, Environment and Society:** Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.

10. **Lifelong Learning:** Should become an independent learner. So, learn to learn ability.

11. **Motivation to take up Higher Studies:** Inspiration to continue educations towards advanced studies on Computer Science.

Additional Program Outcomes: **BCA Degree** (Hons)

The Bachelor of Computer Application (BCA (Hons)) program enables students to attain following additional attributes besides the afore-mentioned attributes, by the time of graduation:

1. Apply standard Software Engineering practices and strategies in real -time software project development

2. Design and develop computer programs/computer -based systems in the areas related to AI, algorithms, networking, web design, cloud computing, IoT and data analytics.

3. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

4. The ability to apply the knowledge and understanding noted above to the analysis of a given information handling problem.

5. The ability to work independently on a substantial software project and as an effective team member.

Model Curriculum for BCA

Sem	Core Courses	Hour / Week Theory	Hour / Week Lab	DS Elective Courses	Hous/ Week
1	i. Fundamentals of Computers ii. Programming in C iii. Mathematical Foundation/ Accountancy iv. LAB: Information Technology v. LAB: C Programming	3 3 3	 4 4		
2	i. Discrete Mathematical Structures ii. Data Structures using C iii. Object Oriented Concepts using JAVA iv. LAB: Data Structure v. LAB: JAVA Lab	3 3 3	 4 4		
3	i. Data Base Management Systems ii. C# and DOT NET Framework iii. Computer Communication and Networks iv. LAB: DBMS v. LAB: C# and DOT NET Framework	3 3 3	 4 4		
4	i. Python Programming ii. Computer Multimedia and Animation iii. Operating Systems Concepts iv. LAB: Multimedia and Animation v. LAB: Python programming	3 3 3	 4 4		
5	i. Internet Technologies ii. Statistical Computing and R Programming iii. Software Engineering iv. LAB: R Programming v. LAB: JAVA Script, HTML and CSS vi. Vocational 1	3 3 3 3	 4 4	(a) Cyber Law and Cyber Security (b) Cloud Computing (c) Business Intelligence	3 3 3
6	i. Artificial Intelligence and Applications ii. PHP and MySQL iii. LAB: PHP and MySQL iv. PROJECT: v. Vocational 2	3 3 3	 4 12	(a) Fundamentals of Data Science (b) Mobile Application Development (c) Embedded Systems	3 3 3
7	i. Analysis and Design of Algorithms ii. Data Mining and Knowledge Management iii. LAB: Algorithms iv. LAB: Data Mining and Knowledge Management v. Vocational 3	3 3	 4 4	(a) Data Compression (b) IoT (c) Data Analytics	3 3 3
8	i. Automata Theory and Compiler Design ii. Cryptography and Network Security iii. Compiler Lab iv. LAB: Project v. Vocational 4	3 3 3	 4 12	(a) Open-Source Programming (b) Storage Area Networks (c) Pattern Recognition (a) Machine Learning	3 3 3 3

TABLE I: COURSE STRUCTURE FOR BCA.

Semester	Course Code	Title of the Paper	Credit	Total Credit of OE, Languages, CAE, Voc, AECC, SEC	Total Credit
I	CAC01	Fundamentals of Computers	3	13	26
	CAC02	Programming in C	3		
	CAC03(a)/(b)	Mathematical Foundation/ Accountancy	3		
	CAC01P	LAB: Information Technology	2		
	CAC02P	LAB: C Programming	2		
II	CAC04	Data Structures using C	3	13	26
	CAC05	Object Oriented Concepts using JAVA	3		
	CAC06	Discrete Mathematical Structures	3		
	CAC04 P	LAB: Data Structure	2		
	CAC05 P	LAB: JAVA	2		
III	CAC07	Data Base Management Systems	3	13	26
	CAC08	C# and DOT NET Framework	3		
	CAC09	Computer Communication and Networks	3		
	CAC07P	LAB: DBMS	2		
	CAC08P	LAB: C# and DOT NET Framework	2		
IV	CAC10	Python Programming	3	13	26
	CAC11	Computer Multimedia and Animation	3		
	CAC12	Operating System Concepts	3		
	CAC10P	LAB: Python programming	2		
	CAC11P	LAB: Multimedia and Animation	2		
V	CAC13	Internet Technologies	3	10	23
	CAC14	Statistical Computing and R Programming	3		
	CAC15	Software Engineering	3		
	CAC13P	LAB: JAVA Script, HTML and CSS	2		
	CAC14P	LAB: R Programming	2		
VI	CAC16	PHP and MySQL	3	10	23
	CAC17	Artificial Intelligence and Applications	3		
	CAC16P	LAB: PHP and MySQL	2		
	CA-P1	Project Work	5		
VII	CAC18	Analysis and Design of Algorithms	3	11	21
	CAC19	Data Mining and Knowledge Management	3		
	CAC18P	LAB: Algorithms	2		
	CAC19P	LAB: Data Mining	2		
	CAI01	Internship	2		
VIII	CAC20	Automata Theory and Compiler Design	3	6	20
	CAC21	Cryptography and Network Security	3		
	CAC20P	LAB: Compiler Lab	2		
	CAP02	Project Work	6		

TABLE II: CS COURSE DETAILS FOR BCA

Course-Type	Course Code as referred above	Compulsory/ Elective	List of compulsory courses and list of option of elective courses. (A suggestive list)
CA	CAC01, CAC02, CAC03(a)/(b), CAC04, CAC05, CAC06, CAC07, CAC08, CAC09, CAC10, CAC11, CAC12, CAC13, CAC14, CAC15, CAC16, CAC17, CAC18, CAC19, CAC20, CAC21	Compulsory	As Mentioned in Table I
CA E	CAE-1A	Elective	Cyber Law and Cyber Security OR Business Intelligence OR Fundamentals of Data Science
	CAE-2A	Elective	Fundamentals of Data Science OR Mobile Application Development OR Embedded Systems
	CAE-3A	Elective	Data Compression OR Internet of Things (IoT) OR Data Analytics
	CAE-4A	Elective	Open-source Programming OR Storage Area Networks OR Pattern Recognition OR Machine Learning
Vocational	Vocational -1	Elective	DTP, CAD and Multimedia OR Hardware and Server Maintenance OR Web Content Management Systems OR Computer Networking OR Health Care Technologies OR Digital Marketing OR Office Automation
	Vocational -2	Elective	
	Vocational -3	Elective	
	Vocational -4	Elective	
SEC	SEC 1	Compulsory	Health & Wellness/ Social & Emotional Learning
	SEC 2	Compulsory	Sports/NCC/NSS etc
	SEC 3	Compulsory	Ethics & Self Awareness
	SEC 4	Compulsory	Professional Communication
AECC	AECC1	Compulsory	Environmental Studies
	AECC2	Compulsory	Constitution of India
Language 1	L1-1, L1-2, L1-3, L1-4	Compulsory	Kannada/Functional Kannada
Language 2	L2-1, L2-2, L2-3, L4-4	Elective	English/Hindi/French/ Additional English/ etc.

Model Course Content for BCA, Semesters I and II

Semester: I

Course Code: CAC01	Course Title: Fundamentals of Computers
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03

Course Outcomes (COs):

- Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers

- Operating systems, functions of operating systems, classification of operating systems, kernel, shell, basics of Unix, shell programming, booting

- Databases, why databases are used, users, SQL, data types in SQL, introduction of queries - select, alter, update, delete, truncate, using where, and or in not in

- Internet basics, features, applications, services, internet service providers, domain name system, browsing, email, searching

- Web Programming basics, introduction of HTML and CSS programming

- Introduction of computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers.

Course Content

Content	Hours
Unit - 1	
Fundamentals of Computers: Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organisation of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples.	10

Unit-2	
Introduction to computers: Characteristics of computers, Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Super computers. Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Microprocessor, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples. Introduction to microcontrollers.	10
Unit-3	
Operating System Fundamentals: Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Microkernel Based Operating System, Booting.	10
Unit-4	
Introduction to Database Management Systems: Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL	6
Unit-5	
Internet Basics: Introduction, Features of Internet, Internet application, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System. **Web Basics:** Introduction to web, web browsers, http/https, URL, HTML5, CSS	6

Text Books:

1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. David Riley and Kenny Hunt, Computational thinking for modern solver, Chapman & Hall/CRC,

Reference:

1. J. Glenn Brook shear," Computer Science: An Overview", Addision-Wesley, Twelfth Edition,
2. R.G. Dromey, "How to solve it by Computer", PHI,

Course Code: CAC01P	**Course Title: Information Technology Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 04

Part A: Hardware

1. Identification of the peripherals of a computer, components in a CPU and their functions.

2. Assembling and disassembling the system hardware components of personal computer.

3. Basic Computer Hardware Trouble shooting.

4. LAN and WiFi Basics.

5. Operating System Installation – Windows OS, UNIX/LINUX, Dual Booting.

6. Installation and Uninstallation of Software – Office Tools, Utility Software (like Anti-Virus, System Maintenance tools); Application Software - Like Photo/Image Editors, Audio Recorders/Editors, Video Editors ...); Freeware, Shareware, Payware and Trialware; Internet Browsers, Programming IDEs,

7. System Configuration – BIOS Settings, Registry Editor, MS Config, Task Manager, System Maintenance, Third-party System Maintenance Tools (Similar to CCleaner and Jv16 PowerTools ...)

Part B: Software

1. Activities using Word Processor Software

2. Activities using Spreadsheets Software

3. Activities using Presentation Software

4. Activities involving Multimedia Editing (Images, Video, Audio ...)

5. Tasks involving Internet Browsing

6. Flow charts: Installation and using of flowgarithms software for different arithmetic tasks like sum, average, product, difference, quotient and remainder of given numbers, calculate area of Shapes (Square, Rectangle, Circle and Triangle), arrays and recursion.

NOTE: In addition to the ones listed above, universities can include other activities so as for the student to become proficient in using personal computers for multiple purposes for which modern computers can be put to use.

Reference:

1. Computational Thinking for the Modern Problem Solver, By Riley DD, Hunt K.A CRC press, 2014

2. Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer

Web References:

http://www.flowgorithm.org/documentation/

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Activity – 1 from Part A	Write up on the activity/ task	5
	Demonstration of the activity/ task	10
Activity-2 from Part B	Write up on the activity/ task	5
	Demonstration of the activity/ task	10
Viva Voice based on Lab Activities		05
Practical Records		05
Total		**40**

Course Code: CAC02	**Course Title: Programming in C**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Confidently operate Desktop Computers to carry out computational tasks
- Understand working of Hardware and Software and the importance of operating systems
- Understand programming languages, number systems, peripheral devices, networking, multimedia and internet concepts
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given problem
- Perform input and output operations using programs in C
- Write programs that perform operations on arrays

Course Content

Content	Hours
Unit - 1	
Introduction to C Programming: Overview of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. **C Programming Basic Concepts:** C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants. **Input and output with C:** Formatted I/O functions - *printf* and *scanf,* control stings and escape sequences, output specifications with *printf* functions; Unformatted I/O functions to read and display single character and a string - *getchar, putchar, gets* and *puts* functions.	10
Unit - 2	
C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion. **Control Structures:** Decision making Statements - *Simple if, if_else, nested if_else, else_if ladder, Switch Case, goto, break* & *continue* statements; Looping	12

Statements - Entry controlled and exit controlled statements, *while, do-while, for* loops, Nested loops.	
Unit - 3	
Derived data types in C: Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. **Strings:** Declaring & Initializing string variables; String handling functions - *strlen, strcmp, strcpy and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric* etc.	8
Unit - 4	
Pointers in C: Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers;	4
Unit - 5	
User Defined Functions: Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type. **User defined data types:** Structures - Structure Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, comparing structure variables, Array of Structures; Unions - Union definition; difference between Structures and Unions.	8

Text Books:

1. C: The Complete Reference, By Herbert Schildt.

2. C Programming Language, By Brain W. Kernighan

3. Kernighan & Ritchie: The C Programming Language (PHI)

Reference Books:

1. P. K. Sinha & Priti Sinha: Computer Fundamentals (BPB)

2. E. Balaguruswamy: Programming in ANSI C (TMH)

3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)

4. V. Rajaraman: Programming in C (PHI – EEE)

5. S. Byron Gottfried: Programming with C (TMH)

6. Yashwant Kanitkar: Let us C

7. P.B. Kottur: Programming in C (Sapna Book House)

Course Code: CAC02P	**Course Title: C Programming Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks:10
Exam Marks: 40	Exam Duration: 04

Programming Lab

Part A:

1. Program to read radius of a circle and to find area and circumference
2. Program to read three numbers and find the biggest of three
3. Program to demonstrate library functions in math.h
4. Program to check for prime
5. Program to generate n primes
6. Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
7. Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
8. Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
9. Program to find the roots of quadratic equation (demonstration of switch Case statement)
10. Program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
11. Program to remove Duplicate Element in a single dimensional Array
12. Program to perform addition and subtraction of Matrices

Part B:

1. Program to find the length of a string without using built in function
2. Program to demonstrate string functions.
3. Program to demonstrate pointers in C
4. Program to check a number for prime by defining isprime( ) function
5. Program to read, display and to find the trace of a square matrix
6. Program to read, display and add two m x n matrices using functions
7. Program to read, display and multiply two m x n matrices using functions

8. Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.

9. Program to Reverse a String using Pointer

10. Program to Swap Two Numbers using Pointers

11. Program to demonstrate student structure to read & display records of n students.

12. Program to demonstrate the difference between structure & union.

Note: Student has to execute a minimum of 10 programs in each part to complete the Lab course

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part B	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Viva Voice based on C Programming		05
Practical Record		05
Total		**40**

Course Code: CAC03(a)	**Course Title:** Mathematical Foundation
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03

Course Outcomes (COs):

- Study and solve problems related to connectives, predicates and quantifiers under different situations.
- Develop basic knowledge of matrices and to solve equations using Cramer's rule.
- Know the concept of Eigen values.
- To develop the knowledge about derivatives and know various applications of differentiation.
- Understand the basic concepts of Mathematical reasoning, set and functions

Content	Hours
Unit - 1	
Basic concepts of set theory: Mathematical logic introduction-statements Connectives-negation, conjunction, disjunction- statement formulas and truth tables- conditional and bi Conditional statements- tautology contradiction-equivalence of formulas-duality law-Predicates and Quantifiers, Arguments.	10
Unit - 2	
Operations on sets: power set- Venn diagram Cartesian product-relations -functions- types of functions - composition of functions.	10
Unit - 3	
Matrix algebra: Introduction-Types of matrices-matrix operations-transpose of a matrix -determinant of matrix - inverse of a matrix- Cramer's rule	10
Unit - 4	
Matrix: finding rank of a matrix - normal form-echelon form cayley Hamilton theorem-Eigen values	6
Unit - 5	
Differential calculus: Functions and limits - Simple Differentiation of Algebraic Functions – Evaluation of First and Second Order Derivatives – Maxima and Minima	6

Text Books:
P. R. Vittal-Business Mathematics and Statistics, Margham Publications, Chennai,
Reference Books:
B. S. Vatsa-Discrete Mathematics –New Age International Limited Publishers, New Delhi

Course Code: CAC03(b)	Course Title: Accountancy
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03

Course Outcomes (COs):

- Study and understand Accounting, systems of Book, Branches of accounting advantage and limitations
- Know the concept of accounting, financial accounting process and Journalization
- Maintenance different account book and reconciliations
- Preparations of different bills, and trial balance.
- Understand the basic concepts of Mathematical reasoning, set and functions

Content	Hours
Unit - 1	
Introduction: History and Development of Accounting, Meaning, Objectives and functions of Accounting, Book keeping V/s Accounting, Users of accounting data, systems of book keeping and accounting, branches of accounting, advantages and limitations of accounting	10
Unit - 2	
Accounting Concepts and Convention: Meaning, need and classification, accounting standards meaning, need and classification of Indian accounting standards. Accounting principles V/s accounting standard Financial Accounting Process: Classification of accounting transactions and accounts, rules of debit and credit as per Double Entry System. Journalization and Ledger posting.	10
Unit - 3	
Preparation of Different Subsidiary Books: Purchase Day book Sales Day Book, Purchase Returns Day Book, Sales Returns Day Book, Cash Book. Bank Reconciliation Statement: Meaning, Causes of Difference, Advantages, Preparation of Bank Reconciliation Statements.	10
Unit - 4	
Account Procedure: Honor of the Bill, Dishonor of the Dill, Endorsement, Discounting, Renewal, Bill for collection, Retirement of the Bill, Accommodation	6

Bills, Bill Receivable Book and Payable Book. Preparation of Trial Balance: Rectification of errors and Journal Proper	
Unit - 5	
Preparation of Final Accounts: Meaning, need and classification, Preparation of Manufacturing, Trading, Profit and loss account and Balance – Sheet of sale-traders and partnership firms.	6

Text Books:

1. S. Ramesh, B.S. Chandrashekar, A Text Book of Accountancy.
2. V.A. Patil and J.S. Korihalli, Book – keeping and accounting, (R. Chand and Co. Delhi).
3. R. S. Singhal, Principles of Accountancy, (Nageen Prakash pvt. Lit. Meerut).
4. M. B. Kadkol, Book – Keeping and Accountancy, (Renuka Prakashan, Hubil)
5. Vithal, Sharma:Accounting for Management, Macmillan Publishers, Mumbai.

Reference Books:

1. B.S. Raman, Accountancy, (United Publishers, Mangalore).
2. Tulsian, Accouning and Finacial Management – I: Financial Accounting – Person Education.

Semester: II

Course Code: CAC04	**Course Title: Data Structures using C**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
- Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
- Demonstrate different methods for traversing trees
- Compare alternative implementations of data structures with respect to performance
- Describe the concept of recursion, give examples of its use
- Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

Course Content

Content	Hours
Unit - 1	
Introduction to data structures: Definition; Types of data structures - Primitive & Non-primitive, Linear and Non-linear; Operations on data structures. Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and de-allocation functions - *malloc*, *calloc*, *realloc* and *free.* Algorithm Specification, Performance Analysis, Performance Measurement Recursion: Definition; Types of recursions; Recursion Technique Examples - GCD, Binomial coefficient $^{n}C_{r}$, Towers of Hanoi; Comparison between iterative and recursive functions.	8
Unit - 2	
Arrays: Basic Concepts – Definition, Declaration, Initialisation, Operations on arrays; Types of arrays; Arrays as abstract data types (ADT); Representation of Linear Arrays in memory; Traversing linear arrays; Inserting and deleting elements; Sorting – Selection sort, Bubble sort, Quick sort, Selection sort, Insertion sort; Searching - Sequential Search,	10

Binary search; Iterative and Recursive searching; Multidimensional arrays; Representation of multidimensional arrays; Sparse matrices.	
Unit - 3	
Linked list: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly liked list, Header liked list, Circular linked list; Representation of Linked list in Memory; Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion; Memory allocation; Garbage collection,	8
Unit - 4	
Stacks: Basic Concepts – Definition and Representation of stacks; Operations on stacks; Applications of stacks; Infix, postfix and prefix notations; Conversion from infix to postfix using stack; Evaluation of postfix expression using stack; Application of stack in function calls. **Queues**: Basic Concepts – Definition and Representation of queues; Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues;	8
Unit - 5	
Trees: Definition; Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth; **Binary tree:** Type of binary trees - strict binary tree, complete binary tree, binary search tree and heap tree; Array representation of binary tree. Traversal of binary tree; preorder, inorder and postorder traversal;	8

Text Books
1. Ellis Horowitz and Sartaj Sahni: Fundamentals of Data Structures

References

1. Tanenbaum: Data structures using C (Pearson Education)
2. Kamathane: Introduction to Data structures (Pearson Education)
3. Y. Kanitkar: Data Structures Using C (BPB)
4. Kottur: Data Structure Using C
5. Padma Reddy: Data Structure Using C
6. Sudipa Mukherjee: Data Structures using C – 1000 Problems and Solutions (McGraw Hill Education, 2007))

Course Code: CAC04P	**Course Title: Data Structures Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 03 Hours

Programming Lab

Part A:

1. Program to find GCD using recursive function
2. Program to display Pascal Triangle using binomial function
3. Program to generate n Fibonacci numbers using recursive function.
4. Program to implement Towers of Hanoi.
5. Program to implement dynamic array, find smallest and largest element of the array.
6. Program to create two files to store even and odd numbers.
7. Program to create a file to store student records.
8. Program to read the names of cities and arrange them alphabetically.
9. Program to sort the given list using selection sort technique.
10. Program to sort the given list using bubble sort technique.

Part B:

1. Program to sort the given list using insertion sort technique.
2. Program to sort the given list using quick sort technique.
3. Program to sort the given list using merge sort technique.
4. Program to search an element using linear search technique.
5. Program to search an element using recursive binary search technique.
6. Program to implement Stack.
7. Program to convert an infix expression to postfix.
8. Program to implement simple queue.
9. Program to implement linear linked list.
10. Program to display traversal of a tree.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Viva Voice based on C Programming		05
Practical Record		05
Total		**40**

Course Code: CAC05	Course Title: Object Oriented Programming with JAVA
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the features of Java and the architecture of JVM
- Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done
- Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism andinheritance
- The students will be able to demonstrate programs based on interfaces and threads and explain the benefits of JAVA's Exceptional handling mechanism compared to other Programming Language
- Write, compile, execute Java programs that include GUIs and event driven programming and also programs based on files

Course Content

Content	Hours
Unit - 1	
Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.	6
Unit - 2	
Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference.	6
Unit - 3	
Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.	8
Unit - 4	
Event and GUI programming: Event handling in java, Event types, Mouse and	10

key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Exceptional handling mechanism.	
Unit - 5	
I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.	6
Unit - 6	
Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.	6

Text Books

1. Programming with Java, By E Balagurusamy – A Primer, Fourth Edition, Tata McGraw Hill Education Private Limited.

2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall

3. Object Oriented Programming with Java : Somashekara, M.T., Guru, D.S., Manjunatha, K.S

Reference Books:
1. Java 2 - The Complete Reference – McGraw Hill publication.

2. Java - The Complete Reference, 7th Edition, By Herbert Schildt– McGraw Hill publication.

Course Code: CAC05P	**Course Title:** JAVA Lab
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 04 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Implement Object Oriented programming concept using basic syntaxes of control Structures
- Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
- Demonstrates how to achieve reusability using inheritance
- Demonstrate understanding and use of interfaces, packages, different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
- Identify and describe common user interface components to design GUI in Java using Applet & AWT along with response to events

Practice Lab

1. Program to print the following triangle of numbers
   1
   1 2
   1 2 3
   1 2 3 4
   1 2 3 4 5
2. Program to simple java application, to print the message, "Welcome to java"
3. Program to display the month of a year. Months of the year should be held in an array.
4. Program to find the area of rectangle.
5. program to demonstrate a division by zero exception
6. Program to create a user defined exception say Pay Out of Bounds.

Programming Lab

PART A: Java Fundamentals OOPs in Java

1. Program to assign two integer values to X and Y. Using the 'if' statement the output of the program should display a message whether X is greater than Y.
2. Program to list the factorial of the numbers 1 to 10. To calculate the factorial value, use while loop. (Hint Fact of 4 = 4*3*2*1)
3. Program to add two integers and two float numbers. When no arguments are supplied, give a default value to calculate the sum. Use function overloading.

4. Program to perform mathematical operations. Create a class called AddSub with methods to add and subtract. Create another class called MulDiv that extends from AddSub class to use the member data of the super class. MulDiv should have methods to multiply and divide A main function should access the methods and perform the mathematical operations.

5. Program with class variable that is available for all instances of a class. Use static variable declaration. Observe the changes that occur in the object's member variable values.

6. Program
   a. To find the area and circumference of the circle by accepting the radius from the user.
   b. To accept a number and find whether the number is Prime or not

7. Program to create a student class with following attributes;
   Enrollment No: Name, Mark of sub1, Mark of sub2, mark of sub3, Total Marks. Total of the three marks must be calculated only when the student passes in all three subjects. The pass mark for each subject is 50. If a candidate fails in any one of the subjects his total mark must be declared as zero. Using this condition write a constructor for this class. Write separate functions for accepting and displaying student details. In the main method create an array of three student objects and display the details.

8. In a college first year class are having the following attributes Name of the class (BCA, BCom, BSc), Name of the staff No of the students in the class, Array of students in the class

9. Define a class called first year with above attributes and define a suitable constructor. Also write a method called best Student () which process a first-year object and return the student with the highest total mark. In the main method define a first-year object and find the best student of this class

10. Program to define a class called employee with the name and date of appointment. Create ten employee objects as an array and sort them as per their date of appointment. ie, print them as per their seniority.

11. Create a package 'student. Fulltime. BCA 'in your current working directory
    a. Create a default class student in the above package with the following attributes: Name, age, sex.
    b. Have methods for storing as well as displaying

PART B: Exception Handling   & GUI Programming

1. Program to catch Negative Array Size Exception. This exception is caused when the array is initialized to negative values.
2. Program to handle Null Pointer Exception and use the "finally" method to display a message to the user.
3. Program which create and displays a message on the window
4. Program to draw several shapes in the created window

5. Program to create an applet and draw grid lines
6. Program which creates a frame with two buttons father and mother. When we click the father button the name of the father, his age and designation must appear. When we click mother similar details of mother also appear.
7. Create a frame which displays your personal details with respect to a button click
8. Create a simple applet which reveals the personal information of yours.
9. Program to move different shapes according to the arrow key pressed.
10. Program to create a window when we press M or m the window displays Good Morning, A or a the window displays Good After Noon E or e the window displays Good Evening, N or n the window displays Good Night
11. Demonstrate the various mouse handling events using suitable example.
12. Program to create menu bar and pull-down menus.

Note: Student has to execute a minimum of 10 programs in each part to complete the Lab course

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Viva Voice based on C Programming		05
Practical Record		05
Total		**40**

Course Code: CAC06	Course Title: Discrete Mathematical Structures
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- To understand the basic concepts of Mathematical reasoning, set and functions.
- To understand various counting techniques and principle of inclusion and exclusions.
- Understand the concepts of various types of relations, partial ordering and
- equivalence relations.
- Apply the concepts of generating functions to solve the recurrence relations.
- Familiarize the fundamental concepts of graph theory and shortest path algorithm

Course Content

Content	Hours
Unit - 1	
The Foundations: Logic and proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy. **Basic Structures**: Sets, Functions, Sequences, Sums, and Matrices: Sets, set operations, Functions, Sequences and Summations, matrices.	12
Unit - 2	
Counting: Basics of counting, Pigeonhole principle, Permutation and combination, Binomial Coefficient and Combination, Generating Permutation and Combination**.** **Advanced Counting Techniques**: Applications of Recurrence Relations, Solving Linear Recurrence, Relations, Divide and Conquer Algorithms and Recurrence Relations, Generating functions, Inclusion-Exclusion, Applications of Inclusion-exclusion.	10
Unit - 3	
Induction and Recursion: Mathematical Induction, Strong Induction and Well-	12

Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Corrections. **Relation:** Properties of relation, Composition of relation, Closer operation on relation, Equivalence relation and partition. Operation on relation, Representing relation.	
Unit - 4	
Graphs: Graphs and Graph models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.	8

Text Book:

1. Discrete Mathematics and Its Applications, Kenneth H. Rosen: Seventh Edition, 2012.

References:

2. Discrete Mathematical Structure, Bernard Kolman, Robert C, Busby, Sharon Ross, 2003.

3. Graph Theory with Applications to Engg and Comp. Sci: Narsingh Deo-PHI 1986.

4. Discrete and Combinatorial Mathematics Ralph P. Grimaldi, B. V. Ramatta, Pearson, Education, 5 Edition.

5. Discrete Mathematical Structures, Trembley and Manobar.

Computer Application Core Courses (CA C) for BCA (Hons)

Sl. No	Course Code	Title of the Paper
1	CAC01	Fundamentals of Computers
2	CAC02	Programming in C
3	CAC03 (a)/(b)	Mathematical Foundation/ Accountancy
4	CAC04	Discrete Mathematical Structures
5	CAC05	Object Oriented Concepts using JAVA
6	CAC06	Data Structures using C
7	CAC07	Data Base Management Systems
8	CAC08	C# and DOT NET Framework
9	CAC09	Computer Communication and Networks
10	CAC10	Python Programming
11	CAC11	Computer Multimedia and Animation
12	CAC12	Operating System Concepts
13	CAC13	Internet Technologies
14	CAC14	Statistical Computing and R Programming
15	CAC15	Software Engineering
16	CAC16	PHP and MySQL
17	CAC17	Artificial Intelligence and Applications
18	CAC18	Analysis and Design of Algorithms
19	CAC19	Data Mining and Knowledge Management
20	CAC20	Automata Theory and Compiler Design
21	CAC21	Cryptography and Network Security

Computer Application Electives (CA E) for BCA (Hons)

Sl. No	Computer Application Electives (CA E)
1	Business Intelligence
2	Cyber Law and Cyber Security
3	Data Analytics
4	Data Compression
5	Embedded Systems
6	Fundamentals of Data Science
7	Internet of Things (IoT)
8	Machine Learning
9	Mobile Application Development
10	Open-source Programming
11	Pattern Recognition
12	Storage Area Networks

Vocational Electives

Sl. No	Vocational Electives
1	DTP, CAD and Multimedia
2	Hardware and Server Maintenance
3	Web Content Management Systems
4	Computer Networking
5	Health Care Technologies
6	Digital Marketing
7	Office Automation

Open Electives in Computer Science:

(For Students studying Core Courses other than Computer Science/ Computer Applications)

Sl. No	Open Electives in Computer Science
1	C Programming Concepts
2	Office Automation
3	Multimedia Processing
4	Python Programming Concepts
5	R Programming
6	E-Content Development
7	E-Commerce
8	Web Designing
9	Computer Animation
10	Accounting Package

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ಟಮಕ, ಕೋಲಾರ – 563103

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: BIOCHEMISTRY

2021-22 onwards

BENGALURU NORTH UNIVERSITY

**Sri Devaraj Urs Extension,
Tamaka, Kolar, behind S.P. Office,
Karnataka 563103**

**Scheme and Syllabus
for I and II Semesters**

B.Sc. (Hons.) degree in Biochemistry
&
open elective course under CBCS
as per NEP 2020
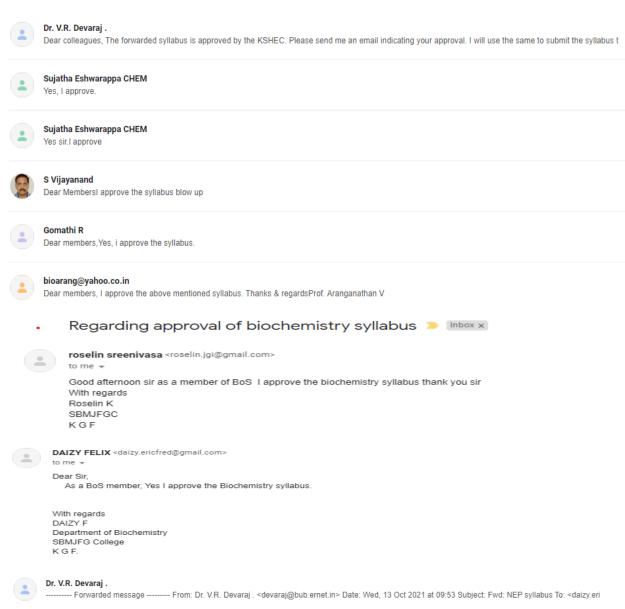
(With effect from 2021-22)

UG Board of Studies in Biochemistry

The Board of Studies in Biochemistry (UG) deliberated on the syllabus provided by the Karnataka State Higher Education Council for B.Sc. basic and Honours degree under NEP-2020 through circulation. The board approved two discipline specific core courses with practical, respectively, for first and second semester and two open electives without practicals.

Members

1. Prof. V. R. Devaraj, Chairman, DOS in Biochemistry,
   Bengaluru City University, Central College Campus, Bangalore -560 001.

2. Mrs. Roselin, K., Dept. of Biochemistry, Sri Bhagavan Jain College, KGF.

3. Mrs.Daizy, F. Dept. of Biochemistry, Sri Bhagavan Jain College, KGF.

4. Mrs. Gomathi, R., Dept. of Biochemistry, Bangalore City College, K.R. Puram

5. Dr. Vijayanand, Dept. of BiochemistryKristu Jayanthi College, Bengaluru.

6. Dr. Bindhu, Dept. of Biochemistry, Jain University, Bengaluru.

7. Dr. Aranaganathan, Dept. of Biochemistry, Jain University, Bengaluru.

6. Mrs. Sujatha Asst. Professor, Dept. of Chemistry,
   Govt. First Grade College for Women, Kolar.

Dr. V.R. Devaraj .
Dear colleagues, The forwarded syllabus is approved by the KSHEC. Please send me an email indicating your approval. I will use the same to submit the syllabus t

Sujatha Eshwarappa CHEM
Yes, I approve.

Sujatha Eshwarappa CHEM
Yes sir.I approve

S Vijayanand
Dear MembersI approve the syllabus blow up

Gomathi R
Dear members,Yes, i approve the syllabus.

bioarang@yahoo.co.in
Dear members, I approve the above mentioned syllabus. Thanks & regardsProf. Aranganathan V

Regarding approval of biochemistry syllabus 📩 Inbox ×

roselin sreenivasa <roselin.jgi@gmail.com>
to me ▾

Good afternoon sir as a member of BoS I approve the biochemistry syllabus thank you sir
With regards
Roselin K
SBMJFGC
K G F

DAIZY FELIX <daizy.ericfred@gmail.com>
to me ▾

Dear Sir,
    As a BoS member, Yes I approve the Biochemistry syllabus.

With regards
DAIZY F
Department of Biochemistry
SBMJFG College
K G F.

Dr. V.R. Devaraj .
---------- Forwarded message --------- From: Dr. V.R. Devaraj . <devaraj@bub.ernet.in> Date: Wed, 13 Oct 2021 at 09:53 Subject: Fwd: NEP syllabus To: <daizy.eri

Bindhu O S
to me ▾

Dear Sir,
I approve the content of the syllabus
Thanks and regards
Dr Bindhu O S

B.Sc. BIOCHEMISTRY (Honors)

Preamble

As one of the basic science disciplines which lead to biotechnological advancement, Biochemistry is a branch of science that explores the chemical processes within and related to living organisms. It focuses on processes at cellular and molecular level. A trained biochemist employs chemical knowledge and bio-analytical skills, in order to unravel biological problems pertaining to physiological processes, diseases related to their malfunctions, diagnostics, prevention, therapy and prognostics. Considering far-reaching advances in modern biology in 21st century, it is imperative to incorporate emerging concepts of biochemistry in academic curriculum. The proposed pattern is designed for multi-faceted development of students, giving the freedom to choose a combination of courses of study from Biochemistry as well as from the allied disciplines. While 14 discipline Specific Courses with 70 credits (12 with practical components for 61 credits and 3 without practical for 9 credits), three discipline specific Electives (9 credits) provide fundamental and advanced courses in Biochemistry, two vocational courses for 6 credits, research project in VIII semester provides much needed orientation and exposure to experimental research. With the Biochemistry major, the candidate can choose a minor from other disciplines such as Botany, Zoology, Environmental science, physics, Electronics, Mathematic, and other allied disciplines for 34 credits, depending on the subject's expertise available in the respective College, University or Institutions.

Further, 24 credit courses shall be from ability enhancement courses (during first two years), and 4 credits shall be from compulsory environmental studies and Constitution of India. Skill enhancement courses for 8 credits earned over first six semesters include Digital fluency, Artificial intelligence, and Cyber security, and Professional communication. Value based courses of Physical education and health and wellness for 12 credits provide opportunities for personality development.

The curricular framework approved by the Karnataka State Higher Education Council and Govt. of Karnataka as part of National Education Policy (NEP-2020) programme shall thus provide understanding of fundamentals, acquiring practical training and application of thesubject knowledge in diversified areas of Biochemistry equipping students with requisite knowledge, skill and personality.

Programme Learning Outcomes

Broad outcomes that a student with B.Sc. (Honours) programme in Biochemistry should be able to demonstrate may involve academic, personal, behavioural as well as entrepreneurial and social competencies as follows;

- o demonstrate an experiential learning and critical thinking of the structure and function of both prokaryotic and eukaryotic cells (including the molecular basis and role of sub-cellular compartmentalization)

- o demonstrate an understanding of the principles, and have practical experience of, a wide range of biochemical techniques (e.g. basic molecular biology, cell biology and microbiology methods, spectrophotometry, the use of standards for quantification, enzyme kinetics; macromolecular purification, chromatography electrophoresis, etc.) and data analysis and competent interpretation.

- o ability to use skills in specific areas related to biochemistry such as industrial production, technology development, clinical, health, agriculture, community development, etc.

- o curiosity and ability to formulate biochemistry related problems and using appropriate concepts and methods to solve them.

- o demonstrate skills to publish research findings, and awareness of IP rights, and scientific publication ethics and problems of plagiarism articulation of ideas, scientific writing and authentic reporting, effective presentation skills.

- o having conversational competence including communication and effective interaction with others, listening, speaking, and observational skills.

- o collaboration, cooperation and realizing the power of groups and community, ability to work in a group, community.

- o ability to grasp ideas and to turn ideas into action related to biochemical mechanisms and processes related to industries, industrial production, health and agriculture, etc.

- o creativity, innovation and risk-taking ability, and social skills to build great teams.

Graduate Attributes for B.Sc. (Honors) in Biochemistry

Graduates with strong academic knowledge, discipline-specific and generic skills complemented with social responsibility are greatest asset of the country. The curriculum frame work under NEP for Biochemistry graduates aims to build the following attributes;

Disciplinary Knowledge:

- Ability to comprehend fundamental concepts of biology, chemistry and apply basic principles of chemistry to biological systems.
- Ability to relate various interrelated physiological and metabolic events.
- Ability to critically evaluate a problem and resolve to challenge blindly accepted concepts
- Ability to think laterally and in an integrating manner and develop interdisciplinary approach
- Good experimental and quantitative skills and awareness of laboratory safety
- A general awareness of current developments at the forefront in biochemistry and allied subjects.
- Awareness of resources, and their conservation.

Communication Skills

- Ability to speak and write clearly in English and local language
- Ability to listen to and follow scientific viewpoints and engage with them.
- Ability to understand and articulate with clarity and critical thinking one's position.

Critical Thinking

- Ability to conceptualize critical readings of scientific texts in order to comprehend.
- Ability to place scientific statements and themes in contexts and also evaluate them in terms of generic conventions.

Problem Solving

- Ability to make careful observation of the situation, and apply lateral thinking and analytical skills.

Analytical Reasoning

- Ability to evaluate the strengths and weaknesses in scholarly texts spotting flaws in their arguments.
- Ability to use scientific evidences and experimental approach to substantiate one's argument in one's reading of scientific texts.

Research Skills

- Ability to formulate hypothesis and research questions, and to identify and consult relevant sources to find answers.
- Ability to plan and write a research paper.

Teamwork and Time Management

- Ability to participate constructively in class room discussions.
- Ability to contribute to group work.
- Ability to meet a deadline.

Scientific Reasoning:

- Ability to analyse texts, evaluating ideas and scientific strategies.
- Ability to formulate logical and convincing arguments.

Reflective Thinking:

- Ability to locate oneself and see the influence of location; regional, national, global on critical thinking.

Self-Directing Learning

- Ability to work independently in terms of organizing laboratory, and critically analysing research literature.

Digital Literacy

- Ability to use digital sources, and apply various platforms to convey and explain concepts of biochemistry.

Multicultural Competence

- Ability to engage with and understand cultures of various nations and respect and transcend differences.

Moral and Ethical Values

- Ability to interrogate one's own ethical values, and to be aware of ethical and environmental issues.

- Ability to read values inherited in society and criticism *vis-a-vis* the environment, religion and spirituality, as also structures of power.

Leadership Readiness

- Ability to lead group discussions, to formulate questions related to scientific and social issues.

Life-long Learning

- Ability to retain and build on critical thinking skills, and use them to update scientific knowledge and apply them in day-to-day business.

The Government of India has notified NEP-2020 on July 29, 2020 based on Dr.Kasturirangan Committee's Report. The objective is to bridge the gap between the current system of education and what is required in the 21st century. It is to have Holistic and Multidisciplinary Under-Graduate Education to produce employable graduates with integrated personality.

The Government of Karnataka had constituted a Task to suggest an Implementation Framework for NEP-2020. It had also constituted two sub-committees, one on Curriculum Reforms in Higher Education and the other on Governance and Regulations.

The Task Force has suggested NEP-2020 Implementation Framework for Karnataka. The State Government has accepted the action plan and taken steps to implement NEP-2020, as per the Implementation Roadmap suggested by the Task Force.

The Sub-committee on Curriculum Reforms in Higher Education had suggested a Draft Curriculum Framework for Undergraduate Programs in various disciplines. The State Govt. had also constituted Faculty-wise Committees to consider this draft framework to formulate program structures in their faculties. These Committees have submitted their reports. The latter were considered in the meetings of all the Vice Chancellors. The following Model Program Structures were designed for various Under-Graduate Programs in Arts, Science, Commerce and Management. The Subject Committees constituted to design and draft the curriculum in their subjects have to follow these Model Program Structures. The Terminology used in these Program Structures are.

Discipline Core (DSC) refers to Core Courses/Papers in a Core Discipline/Subject

Discipline Elective (DSE) refers to Elective Courses/Papers in the Core Subject or Discipline.

Open Elective (OE) refers to Elective Courses/Papers in a non-core Subject across all disciplines.

Program Structures also contain Ability Enhancement Compulsory Courses (AECC), Languages, Skill Enhancement Courses (SEC) (Both skills and value based). Pedagogy involves L+T+P model. Generally subjects with practical involve L+P, while the subjects without practicalinvolve L+T model. The numbers in parentheses indicate credits allotted to various courses/papers as per definitions of Choice Based Credit System (CBCS). Generally 1 hour of Lecture or 2 hours of practical per week in a semester is assigned one credit. Generally core subject theory courses/papers will have 3 or 4 credits, while practical are assigned 2 or 3 credits.

Job opportunities in Biochemistry Core Course

Exit After one year: *CERTIFICATE COURSE*

Knowledge	*Skill Acquired*	*Employability*
Fundamental properties of elements, atoms, acids and bases, metals, non-metals, alloys and composites. Biological significance of elements. Understanding of chemical bonding, Physical properties of molecules, chemistry of toxic chemicals. Chemical kinetics, Colligative properties, Properties of matter and electro chemistry, fundamentals and applications of nuclear and radio chemistry. Classification, structure, reactivity and biological significance of major organic compounds. A general scientific spirit of inquiry	*Numerical calculations, data generation and analysis, including the application of data transformations. laboratory, safety and precautions, proficiency in preparation of laboratory reagents, use of glassware, Demonstration of basic oxidation and reduction reactions, primary and secondary standards. Handling basic instruments.* *Communication interpersonal and leadership skills, and ability enhancements complementing the core biochemistry, Entrepreneurship*	Small and medium size chemistry/pharma based laboratories; as Jr. laboratory assistant assisting chemists/scientists. QC assistants in Laboratories dealing with QC service. Toiletries, chemicals, perfumery, oil industries, distilleries/ textiles/ pollution control units Entrepreneurship

Exit after two year: *Diploma COURSE*

Basic chemistry of natural compounds, alkaloids, terpenes, heterocyclic compounds, drugs, stereochemistry, biological relevance of these compounds, outlines of Photochemistry and environmental chemistry. History of Biochemistry, Comprehensive knowledge and hand-on training in laboratory techniques of biochemistry. Analytical instrumentation and methodology	*Acquaintance with analytical techniques that will permit them to study the biological system. Demonstrating skills of fractionating organic compounds.* *Hands on experience of handling instruments and analysis of data.* *Improving personality traits, team work, organizing abilities. Communication skills*	Assistants in Health care/paramedical laboratories. Supervision and maintenance of laboratories. QC assistants in analytical laboratories dealing with biochemical/clinical/Food processing/pharma industrial settings. Marketing Entrepreneurial opportunities, Material safety data sheet maintenance, curation of chemical/drug stores, chemical store keeping

Exit after three years: *B.Sc. degree*

Knowledge	*Skill Acquired*	*Employability*
Comprehensive knowledge of biomolecules: higher order structure s of proteins, nucleic acids and their functions. Bioenergetics, metabolism, enzyme kinetics, basic molecular biology, industrial microbiology, Immunology recombinant DNA technology. Understanding interrelated physiological and metabolic events. Overall knowledge of avenues for research and higher academic achievements in the field of biochemistry and allied subjects.	*Basic skills in clinical laboratory techniques, Immunology and molecular biological experimental skills. Demonstrate the overall ability to independently design experiment and analyse data. Basic statistical handling of data.* *Oral and written skills to convey scientific experimental results. Ability to understand research findings and disseminate to common public. Teaching skills*	Scientific assistants in biotech based industries. Chemical/pharma/animal feeds/scientific data mining, / Forensic science labs. Blood Banks, Public heath support staff, Clinical research, Drug discovery R&D, Medical coding, medical transcription, Medical content writing Teaching at secondary school level
B.Sc. (Hons.)		
Introduction to advanced concepts in Biochemistry; Molecular Biology, Recombinant DNA technology, Clinical Biochemistry/ Plant Biochemistry, Immunology, Nutrition and Dietetics, Biochemical Pharmacology, Research methodology, Bioinformatics skills, data analysis, Pharmacogenomics, Introduction to Intellectual property rights. A strong theoretical and practical knowledge of clinical and molecular setting, core research *exposure.*	*Skills to isolate, identify and quantify biomolecules. Conducting independent research as part of project work. Hands-on training in modern techniques of Molecular biology. Recombinant DNA techniques, Computational skills, Prism, graph pad, Excel, Scientific writing skills: general articles, research reviews, Debating on scientific inventions and social implications.*	Research staff in modern biology laboratories, Industries, Research Institutions. Clinical Biochemist, Forensic science technician, Biomedical scientist, Nutrition Dept. Pharma and Clinical research industries, R&D divisions of Pharma industries, Vaccine industry. Medical coding, Bioinformatics, Medical content writing, Patent examiner, Toxicological asst. Medical Science Liaison officer,

IIA. Model Program Structures for the Under-Graduate Programs in Universities and Colleges in Karnataka

Bachelor of Arts (Basic/ Hons.)/ Bachelor of Science (Basic/Hons.) in subjects with practical, with one major and one minor
(Biochemistry major with suitable minor)

Sem.	Discipline Core (DSC) (Credits) (L+T+P)	DisciplineElective(DSE) / Open Elective (OE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC), Languages (Credits) (L+T+P)		Skill Enhancement Courses (SEC)			Total Credits
					Skill based (Credits) (L+T+P)	Value based (Credits) (L+T+P)		
I	Biochem.1(4+2) Discipline B1(4+2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs each)		SEC-1:Digital Fluency (2)(1+0+2)	Physical Education -Yoga (1)(0+0+2)	Health & Wellness (1) (0+0+2)	25
II	Biochem.2(4+2) Discipline B2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs each)	Environmental Studies (2)		Physical Education-Sports (1)(0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
	Exit option with Certificate (50 credits)							
III	Biochem.3(4+2) Discipline B3(4+2)	OE-3 (3)	L1-3(3), L2-3(3)(4 hrs each)		SEC-2:ArtificialInte-lligence(2)(1+0+2)	Physical Education-Sports (1)(0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
IV	Biochem.4(4+2) Discipline B4(4+2)	OE-4 (3)	L1-4(3), L2-4(3)(4 hrs each)	Constitution of India (2)		Physical Education - Sports (1)(0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
	Exit option with Diploma (100 credits) OR Choose any one of the core subjects as Major and the other as Minor							
V	Biochem.5(3+2) Biochem.6(3+2) Discipline B5(3+2)	Vocational-1 (3)			SEC-3: SEC such as Cyber Security(2) (1+0+2)	Physical Education-Sports (1)(0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	22
VI	Biochem.7(3+2) Biochem.8(3+2) Discipline B6(3+2)	Vocational-2 (3) Internship (2)			SEC-4: Professional Communication (2)	Physical Education - Sports (1)(0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	24
	Exit option with Bachelor of Arts, B.A./ Bachelor of Science, B.Sc. Basic Degree (with a minimum of 146credits) or continue studies with the Major							
VII	Biochem.9(3+2) Biochem.10 (3+2) Biochem.11(3)	Biochem. E-1(3) Biochem. E-2(3) Res. Methodology (3)						22
VIII	Biochem.12(3+2) Biochem.13(3) Biochem.14(3)	Biochem. E-3(3) Research Project (6)*						20
	Award of Bachelor of Arts Honours, B.A. (Hons.)/ Bachelor of Science Honours, B.Sc. (Hons) degree in a discipline (with a minimum of 188 credits)							

In lieu of the research Project, two additional elective papers/ Internship may be offered.

Semester	1 (First)
Course title	Chemical foundation of Biochemistry -1
Course credits:	4
Total contact hours:	56
Duration of end semester assessment	02h
Formative assessment marks	40
Summative assessment marks	60

Course learning Outcome:

➢ Understanding of Biochemistry as a discipline and milestone discoveries in life sciences that led to establishment of Biochemistry as separate discipline.

➢ Fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms.

➢ Understanding of the concepts of mole, mole fraction, molarity, etc. and to apply them in preparations of solutions of desired strengths.

➢ Revisit to fundamentals of chemical bonds, electronic configuration, theories of bond formation.

➢ Unique property of water as a universal solvent and its importance in biological system.

➢ Understanding of fundamentals of physical phenomena associated with Adsorption, Viscosity, Distribution law, Osmotic pressure, etc. and their importance in living organisms.

➢ Understanding of concepts of acids, bases, indicators, pKa values, etc. Acquiring numerical skills

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UNIT-1: Introduction to Biochemistry   **14hrs**

Origin of life, Miller's experiment, types of organisms, prokaryotes, eukaryotes, unicellular multicellular, compartmentalization of functions in lower and higher organisms, and common physiological events of organisms (RQ), chemical composition of living organisms, subcellular organelles: Structure, function and interrelationship.

SI units, Mass, volume, temperature, amount, length and time, an overview of the metric system, atomic weight, molecular weight, equivalent weight, basicity of acids, acidity of bases, Avogadro`s number, molarity, normality, molality, Dalton concept, mole concept, concentration, mole to molar conversion, oxidation number and its significance, density and specific gravity, their significances.

UNIT-2: Atomic structure and chemical bonds   14 hrs

Structure of an atom, electrons and Quantum numbers, orbitals, shapes of orbitals, s, p, d, and f sub shells, K, L, M, N, O, P, and Q shells. Illustration of Pauli`s exclusion principle, Aufbau principle, and Hund`s rule, electron configuration: up to atomic number 20, octet rule. Formation and properties of non-covalent and covalent bonds, hydrogen bonds, ionic bonds, van der Waals interactions, London forces, dipole-dipole interactions, electrostatic interactions, and hydrophobic interactions. Sigma, pi and co-ordinate bonds, back bonding, corresponding energy associated, outline of theories of bonding: Valence bond theory, Molecular orbital theory and crystal field theory.

UNIT-3: Buffers and colligative properties   14 hrs

Acids, bases, Arrhenius concept, Lowry and Bronsted concepts, Lewis concept. Buffers, composition, pH, pH scale, Henderson-Hasselbalch equation, titration curve of H_3PO_4, pK value, isoelectric pH, ionization of HCl, CH_3COOH, NH_4OH, H_2SO_4. Colligative properties and anomalous colligative properties of solutions, structure of water based on VSEPR theory, ionic product of water, special properties of water, buffers in animal system. Solutions and types, ionizable solutes, non-ionizable solutes, vapor pressure and its application in distillation, Van't Hoff law – Boyle's and Charles' law, Roult`s law of Relative lowering of vapour pressure (RLVP), boiling point, freezing point, de-icing, osmosis and osmotic pressure determination by Berkeley and Hardley's method, reverse osmosis.

UNIT–4: Electrochemistry and redox reactions   14 hrs

Scope of electrochemistry, electrochemical cells, Daniel cell, galvanic cell, electrode potential and its measurement, electrolysis, types of electrolytes, primary and secondary batteries, electrodes, half-cell reaction, standard electrodes. Laws of thermodynamics, entropy and enthalpy, their relation, Gibb`s energy, free energy change, ions, Redox reactions, types, Stock's notations, change in oxidation number and combination. Endergonic and exergonic reactions with examples, their importance in biological systems, redox potential, application of redox potential, energy linked to redox reactions, reduction of oxygen, oxidation and reduction of iron in hemoglobin, biologically active forms of zinc, calcium, nickel, molybdenum, selenium, and cobalt, $NAD^+/NADH$, $NADP^+/NADPH$, $FAD/FADH_2$, $FMN/FMNH_2$.

REFERENCES

1. Advanced Inorganic Chemistry: A comprehensive Text,1999, Cotton and Geoffrey Wilkinson, 6th edition, Wiley publication
2. Inorganic Chemistry, 2014, Miessler GL, Paul Fischer PJ, and Tarr DA, 5th edition, Pearson Publication.
3. Inorganic Chemistry, 2004, Catherine E and Sharpe AG, ACS publication
4. Inorganic Chemistry, 2015, Overton, Rourke, Weller, Armstrong and Hagerman,

Oxford Press.
5. Physical Chemistry: A molecular approach, 2019, Donald A, McQuarrie and Simon JD, Viva Books Publication.
6. Physical chemistry 2019,Atkins P, Paula JD, Keeler J, 11th edition, Oxford press
7. Biochemical Calculations, 1976, Irwin H. Siegel 2nd Ed. John Wiley and Sons.
8. A biologist's Physical Chemistry, 1976, 2nd Edition, J Gareth Morris, Edward Arnold Ltd.

Pedagogy: Lectures/problem solving/ assessments/group discussions/industrial visits

Formative Assessment	
Assessment occasion	**Weightage in marks**
Continuous evaluation and class test	**20**
Seminars/Class work	**10**
Assignments/Discussions	**10**
Total	**40**

Semester-I: Practical-I

Semester	1 (First)
Course title	Volumetric Analysis, Practical -1
Course credits:	2
Total contact hours:	4 hrs/week
Duration of end semester assessment	03h
Formative assessment marks	25
Summative assessment marks	25

Course Outcome: The Course Objective is to provide experimental practice of quantitative and qualitative analysis. Also, it provides training in physical chemistry laboratory techniques. Upon successful completion, students should develop skills in handling instruments and understand its application in research work.
- Understanding Good laboratory practices in a chemistry/biochemistry laboratory.
- Learn safety and precautionary measures for working in a laboratory.
- Develop skill and proficiency in preparation of laboratory reagents.
- Use of handling of glass wares, minor equipment for conducting experiments.
- Develop skills to prepare standard chemical solutions and secondary standards.
- Demonstration of basic oxidation and reduction reactions.

Experiments:

1. Calibration of volumetric glassware's (Burette, pipette, standard flasks).
2. Concept of molarity, molality and normality. Calculation and preparation of molar solutions (Problems to be given for exams). Calculation and preparation of normal solutions and percent solutions and dilute solutions
3. Preparation of standard Sodium carbonate solution, standardization of HCl (Methyl orange) and estimation of NaOH in the given solution. (Methyl orange or phenolphthalein).
4. Preparation of standard Oxalic acid. Standardization of NaOH and estimation of H_2SO_4 in the given solution (phenolphthalein).
5. Preparation of standard Oxalic acid. Standardization of $KMnO_4$ and estimation of H2O2 in the given solution.
6. Preparation of standard $K_2Cr_2O_7$. Standardization of $Na_2S_2O_3$ and estimation of $CuSO_4$ in the given solution.
7. Preparation of ZnSO4. Standardization of EDTA and estimation of total hardness of water using Eriochrome black-T indicator.
8. Preparation of standard potassium bipthalate. Standardization of NaOH and estimation of HCl in the given solution. (Phenolphthalein).

9. Estimation of sulphuric acid and oxalic acid in a mixture using standard sodium hydroxide solution and standard potassium permanganate solution.

10. Preparation of standard Potassium dichromate and estimation of ferrous/ferric mixture using diphenylamine indicator (Demonstration).

11. Preparation of standard oxalic acid solution. Standardization of NaOH solution and estimation of acidity in vinegar.

12. Preparation of standard potassium biphthalate solution, standardization of sodium hydroxide solution and estimation of alkalinity of antacids.

13. Preparation of standard Oxalic acid solution. Standardization of $KMnO_4$ solution and estimation of calcium in milk.

14. Preparation of buffers; phosphate, bicarbonate and acetate buffers

15. Construction of Daniell Cell and measurement of emf.

REFERENCES

1. Vogel's Qualitative Inorganic Analysis, 2012, Svehla, G. Pearson Education,.
2. Quantitative Chemical Analysis, 2009, Mendham, J. Vogel's Pearson,.
3. Practical Chemistry, O. P. Pandey, D. N. Bajpai, and S. Giri, S. Chand and Co. Ltd.
4. Principles of Practical Chemistry- M. Viswanathan
5. Instrumental Methods of chemical Analysis B.K Sharma.
6. Experiments in Physical Chemistry R.C. Das and B. Behra, Tata Mc Graw Hill
7. Advanced Practical Physical Chemistry J.B.Yadav, Goel Publishing House
8. Advanced Experimental Chemistry. Vol-I J.N.Gurtu and R Kapoor, S.Chand and Co.
9. Practical Chemistry K.K. Sharma, D. S. Sharma (Vikas Publication).
10. General Chemistry experiment – Anil J Elias (University press).
11. Vogel textbook of quantitative chemical analysis G.H. Jeffery, J. Basset.
12. Quantitative chemical analysis S. Sahay (S. Chand & Co.).
13. Practical Chemistry, O P Pandey, D N Bajpai, Dr S Giri. S. Chand Publication
14. College Practical Chemistry, V K Ahluwalia, Sunitha Dingra, Adarsh Gulati
15. Practical Physical Chemistry- B. Viswanathan, P S Raghavan, MV Learning Publication.

Pedagogy*: Lab work/ problem solving/ assessments/group discussions/industrial visits*

Formative Assessment	
Assessment occasion	**Weightage in marks**
Continuous evaluation (2- class tests)	15
Record / viva voce	10
Total	25

Second Semester

Course Title	Chemical foundation of biochemistry -2
Course credits	**04**
Total contact hours	**56**
Duration of End semester Assessment	**02**
Formative Assessment Marks	**40**
Summative assessment Marks	**60**

Course Outcome:
- These topics will enable students to understand the fundamentals of chemical processes in biological systems
- Appreciation of the roles of metals, non-metals, transition metals and coordination compounds in biological systems.

Course Outcomes/Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12
Aptitude	X	X										
Critical thinking	X	X										
Subject clarity	X	X										
Analytical Skills	X	X										

Course content

UNIT-1: Chemical kinetics and colloids	14 Hours

Introduction, Rate of reactions, rate law or rate equation, molecularity and order of a reaction with examples, velocity constant or rate constant and half-life period expressions for zero, first and second order reactions with derivations (a=b and a ≠b), rate constant of irreversible reaction, kinetics of reversible reaction (without derivation). Numerical problems. Effect of temperature, pressure and catalyst on rate of reaction, Arrhenius equation and Arrhenius interpretation of energy of activation. Transition state theory with

brief explanation.

Colloids: true solutions, classification, peptisation, purification, ultrafiltration, Brownian movements, electric properties, coagulation, mutual, lyophilic sols, boiling, dialysis, electro- and persistent dialysis, addition of electrolytes, colloids in daily life and applications. Emulsion, types, micelles with biomolecules and its biological applications.

UNIT-2: Nomenclature of Organic Compounds: 14 Hours

Classification, naming- IUPAC nomenclature, compounds containing one, two functional groups with chains, homologous series. Stereochemistry, geometrical and structural isomerism, conformation and free rotation. Optical isomerism, symmetry of elements, plane polarized light and optical purity, calculations. Nomenclature of enantiomers, epimers, racemic mixture, resolution. Fischer and Newmann projection formulae, molecule with one and two chiral and achiral centers, spyrines. Priority rules; E and Z (CIP rules), R and S, D and L notations, absolute (r and s) and relative (d and l) configuration. Role of stereochemistry in biological systems.

UNIT-3: Organometallic Compounds   14 Hours

Metal atom linked organic compounds. Preparation of Grignard reagents and structure, limitations, protonolysis and reactions. Organolithium compounds, preparation and reactions. Organozinc compounds. Organoboranes its mechanisms. Ferrocenes. Organomercury compounds: Methods of preparation and applications, reactions– mercuration of aromatic compounds, solvomercuration, oxymercuration- demercuration. Organosilicon compounds: Methods of preparations and applications, general reactions of trialkyl silyl halides with ethers, esters, carbamides, epoxides and acetals.

Porphyrins and Metal ions: Role of metal ions in biological systems, Fe, Cu, Zn, structure and functions of porphyrins, metalloporphyrins and iron-sulphur clusters with suitable examples and their role in biological systems.

UNIT-4: Inorganic Chemistry   14 Hours

Nomenclature of inorganic molecules and coordination compounds, formula. IUPAC nomenclature. Central metal ion, ligand, coordination number, sphere, complex ion, oxidation number of central atoms, homoleptic and heteroleptic complexes. Isomerism in complexes, structural, ionization, solvate (hydrate), linkage and coordination, Stereoisomerism, geometrical, optical isomerism with simple inorganic complexes. Applications of qualitative/ quantitative analysis, photographic, metallurgy, medicine, catalysis and biosystems.

Chemical toxicity: Introduction, poisons, lead, mercury, aluminium, arsenic, corrosives, cyanide, irritants, phosphorus, CO_2, SO_2, SO_3, NO_2, halides and acid fumes, poisoning; sources, signs and symptoms. Free radicals: introduction, definition, generation and scavenger systems.

REFERENCES

1. Physical Chemistry, 2006, Peter Atkins. 8th edition, W.H. Freeman and Company
2. Inorganic Chemistry: 2006, Principles of structure and Reactivity, Huheey JE, Keiter EA, Keiter RL, Pearson Education India
3. Stereochemistry: Conformation and Mechanism, 2009, Kalsi PS, New Age International Publications
4. Introduction to Stereochemistry, 2012, Kurt Mislow, Dover Publications
5. A text book of Organic Chemistry, 2016, Raj K Bansal, 6th edition, New Age International Publications
6. Advanced Inorganic Chemistry,1999, Cotton et.al, 6th edition, A Wiley-International
7. Principles of physical Chemistry, Puri, Sharma and Pathania.
8. Physical Chemistry, R.L. Madan, G.D. Tuli. S. Chand and Co.
9. A Text Book of Physical Chemistry, K.L. Kapoor, Vol.2. McMillan Publisher, India Ltd.
10. Advanced Organic Chemistry, Bahl and Bahl.
11. Principles of oraganometallic Chemistry, 1991, P. Powell, 2nd Edition, ELBS.
12. Inorganic Chemistry, 1983, 3rd Edition, J.E. Huheey, Harper International.
13. Organic Chemistry, Claden J., Greeves, N., Warren, S. 2012, Oxford University Press.
14. Inorganic Chemistry, 1987, R.W. Hay, Ellis Harwood.
15. Bioinorganic Chemistry, 2002, R.M. Roat-Malone, John-Wiley.
16. Basic Organometallic chemistry, 2nd Edition, B.D. Gupta and A.J Elias.

Pedagogy: Lab work/ problem solving/ assessments/group discussions/industrial visits

Formative Assessment	
Assessment occasion	**Weightage in marks**
Continuous assessment (2-Class tests)	20
Seminars/class work	10
Assignment/open discussion	10
Total	40

Practical-2

Course title	Qualitative and quantitative analysis
Course credits	02
Total contact hours	4 Hours/Week
Duration of end semester assessment	03
Formative assessment marks	25
Summative assessment marks	25

Course Outcome: The Course Objective is to provide experimental practice of quantitative and qualitative analysis. Also, it provides training in physical chemistry laboratory techniques. Upon successful completion, students should develop skills in handling instruments and understand its application in research work.

Experiments:

1. *Systematic Semi-micro qualitative Analysis of Inorganic salt Mixtures*

    (a) Systematic semi micro qualitative analysis of two acid and two basic radicals in the given inorganicsalt mixture. The constituent ions in the mixture to be restricted to the following (Any four binary mixtures shall be given)

    Anions: HCO_3^-, CO_2^-, Cl^-, Br^-, NO_3^-, BO_3^{3-} SO_4^{2-}, and PO_4^{3-}

    Cations: Pb^{2+}, Al^{3+}, Fe^{2+}, Fe^{3+}, Mn^{2+}, Zn^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, K^+, Na^+

    and NH^+.

    (b) Qualitative analysis of NPK fertilizers

2. Determination of density and viscosity of the given liquid using specific gravity bottle and Ostwald's viscometer.

3. Determination of density and surface tension of the given liquid using specific gravity bottle and stalagmometer.

4. Determination of molecular weight of non-volatile solute by Walker-Lumsden method.

5. Determination of rate constant of decomposition of H_2O_2 using $KMnO_4$ by volumetric analysis method using ferric chloride as catalyst.

6. Determination of distribution coefficient of benzoic acid between water and benzene or iodine between water and carbontetra chloride Separation of Two Components from given Binary Mixture of Organic Compounds Qualitatively.(Types of binary mixtures-Solid– Solid, Solid–Liquid, Liquid – Liquid)

7. Verification of Beer's Law.

    (i) Estimation of unknown concentration of a biomolecule by using colorimeter

    (ii) Determination of molar extinction coefficient

8. Calibration of pH meter and determination of pH of aerated soft drinks.

REFERENCES

1. Vogel's Qualitative Inorganic Analysis, 2012, Svehla, G. Pearson Education,.
2. Quantitative Chemical Analysis, 2009, Mendham, J. Vogel's Pearson,.
3. Practical Chemistry, O. P. Pandey, D. N. Bajpai, and S. Giri, S. Chand and Co. Ltd.
4. Principles of Practical Chemistry, M. Viswanathan
5. Instrumental Methods of chemical Analysis B.K Sharma.
6. Experiments in Physical Chemistry R.C. Das and B. Behra, Tata Mc Graw Hill
7. Advanced Practical Physical Chemistry J.B.Yadav, Goel Publishing House
8. Advanced Experimental Chemistry. Vol-I J.N.Gurtu and R Kapoor, S.Chand and Co.
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11. Vogel textbook of quantitative chemical analysis G.H. Jeffery, J. Basset.
12. Quantitative chemical analysis S. Sahay (S. Chand & Co.).
13. Practical Chemistry, O P Pandey, D N Bajpai, Dr S Giri. S. Chand Publication
14. College Practical Chemistry, V K Ahluwalia, Sunitha Dingra, Adarsh Gulati
15. Practical Physical Chemistry- B. Viswanathan, P S Raghavan, MV Learning Publication.

Pedagogy*: Lab work/ problem solving/ assessments/group discussions/industrial visits*

Formative Assessment	
Assessment occasion	**Weightage in marks**
Continuous evaluation (2- class tests)	15
Record / viva voce	10
Total	25

Biochemistry *Open Elective -1* for First Semester

Course title	*Biochemistry in Health and Disease*
Course credits	**03**
Total contact hours	**42**
Duration of end semester examination	**2.5 h**
Formative assessment marks	**40**
Summative assessment marks	**60**

Course Outcome: This open elective course offering to students of various streams gives knowledge about health and various terminologies used in health and disease conditions; Difference between communicable and non-communicable diseases; Health promotion and treatments for various diseases and disorders.

UNIT-1: Health and wellness: 14hours

WHO definition of health, Health and hygiene, General health care, Factors affecting health, Indices and evaluation of health, Disease patterns in developed and developing world; Classification of diseases-Endemic, Epidemic, Pandemic; Professional health hazards.

Disease conditions: Acute disease, chronic disease, Incurable disease, Terminal disease, Illness, disorders, Syndrome, Pre-disease.

Treatment: Psychotherapy, Medications, Surgery, Medical devices, and Self-care.
Dimensions of Health: Physical, Mental, Spiritual, Emotional, Environmental, and Philosophical.

UNIT–2 Diseases and disorders   14 hours

Communicable diseases: Tuberculosis, Cholera, Typhoid, Conjunctivitis.

Sexually transmitted diseases (STD): Information, statistics, and treatment guidelines for STD, Prevention: Syphilis, Gonorrhea, AIDS.

Non-communicable diseases: Malnutrition Undernutrition, Overnutrition, Nutritional deficiencies; Anemia, Stroke, Rheumatic heart disease, Coronary heart disease, Cancer, blindness, accidents, mental illness, Iodine deficiency, Fluorosis, Epilepsy, Asthma.

Genetic disorders: Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Thalassemia, Sickle cell anemia.

Lifestyle disorders: Obesity, Liver cirrhosis, Diabetes mellitus, Hypertension (Causative agents, symptoms, diagnosis, treatment, prognosis, prevention)

UNIT–3 Health and awareness	14 hours

Preventing drug abuse, Oral health promotion by tobacco control. Mental hygiene and mental health: Concepts of mental hygiene and mental health, Characteristics of mentally healthy person, Warning signs of poor mental health, Promotive mental health, strategies and services, Ego defense mechanisms and implications, Personal and social adjustments, Guidance and Counseling.

Infection control: Nature of infection, Chain of infection transmission, Defenses against infection transmission

REFERENCES

1. Modern Nutrition in Health and Disease, 2006, 10th Edition, Maurice E. Shils, Moshe Shike, A Catharine Ross.
2. Clinical Biochemistry and Metabolic Medicine, 2012, Eighth Edition, Martin Andrew Crook, CRC Press,
3. Nutrition and Health in Developing Countries, 2000, Editors: R. Semba and M.W. Bloem, Humana Press.

Pedagogy: Lectures/desk work/book chapter/problem solving/discussion/assignment

Formative assessment	
Assessment occasion	**Weightage in marks**
Class test (2 class tests)	20
Seminars/class work	10
Assignment/open discussion	10
Total	40

Biochemistry *Open Elective -2* for First Semester

Course title	*Biochemistry of Cell*
Course credits	**03**
Total contact hours	**42**
Duration of end semester examination	**2.5 h**
Formative assessment marks	**40**
Summative assessment marks	**60**

Course Outcome:

This open elective course offering to students of various streams gives knowledge about biomolecules in their cellular environment. Further, they will learn basic chemistry of amino acids, peptides, sugars, polysaccharides, nucleosides, nucleotides, nucleic acids, lipids, vitamins, coenzymes and metal ions.

UNIT - 1   14 hours

1. **Biomolecules in their cellular environment:** The cellular basis of life. Cellular structures– prokaryotes and eukaryotes. Chemical principles in biomolecular structure. Major classes of biomolecules. Role of water in design of biomolecules.

2. **Amino acids and peptides**: Structure of amino acids, c**lassification** of amino acids based on polarity, derivatives of amino acids and their biological role. Peptide bond, Properties of a peptide, biologically important peptides.

UNIT - 2   14 hours

3. **Sugars and polysaccharides:** Basic chemistry of sugars, optical activity. Disaccharides, trisaccharides and polysaccharides - their distribution and biological role.

4. **Nucleosides, nucleotides and nucleic acids:** DNA structures and their importance, different types of RNA. Unusual DNA structures, other functions of nucleotides.

UNIT - 3   14 hours

5. **Lipids:** Different classes of lipids and their distribution, storage lipids, structural lipids in membranes, lipids as signal molecules, cofactors and pigments.

6. Vitamins, coenzymes and metal ions: Occurrence and nutritional role. Coenzymes and their role in metabolism. Role of metal ions in biological system and their significance - heme, porphyrins and cyanocobalamin.

References:

1.Lehninger- Principles of Biochemistry-DL Nelson and MM Cox [Eds), 6th Edn. Macmillan Publications (2012).

2. Biochemistry Ed. Donald Voet & Judith G. Voet, John Wiley & Sons, Inc.(2010).

3. The Cell: A Molecular Approach, Cooper and Hausman (2013)

Pedagogy: Mooc/Desk Work/Book Chapter/Problem Solving /Assignment

Formative assessment	
Assessment occasion	**Weightage in marks**
Class test (2 class tests)	20
Seminars/class work	10
Assignment/open discussion	10
Total	40

Biochemistry *Open Elective*-1 for Second Semester

Course title	*Nutrition and Dietetics*
Course credits	03
Total contact hours	42
Duration of end semester examination	2.5 h
Formative assessment marks	40
Summative assessment marks	60

Course outcomes:

- Knowledge about energy requirements and the Recommended Dietary Allowances.
- understanding the functions and role of macronutrients, their requirements and the effect of deficiency and excess
- Understand the impact of various functional foods on our health
- To be able to apply basic nutrition knowledge in making foods choices and obtaining an adequate diet.
- Competence in connecting the role of various nutrients in maintaining health and learn to enhance traditional recipes.

UNIT–1 Basic concepts of Nutrition: 14 Hrs

Introduction, Basic principles of a balanced diet to provide energy and nutrients. Composition of foods and proximate analysis of foods. Calorific value of foods and Basal metabolism. Basal Metabolic Rate (BMR), Factors affecting BMR, Energy requirements for different physical activities, Specific dynamic action of food, Nutritive value of proteins. Energy requirements and recommended dietary allowance (RDA) for infants, children, and pregnant women. Protein calorie malnutrition.

UNIT–2 Macronutrients and Micronutrients   14 Hrs

Carbohydrates-Digestible and non-digestible, Dietary fibres, Essential fatty acids, lipoproteins and cholesterol. Essential amino acids, Fortification of foods, Protein requirement for different categories.

Vitamins: Sources, requirements, functions and deficiency symptoms of Vitamin-C, Thiamine, Riboflavin, Pyridoxine, Folic acid, VitaminB_{12}. Absorption of fat-soluble vitamins- A, D, E and K.

Micronutrients: Source, Daily requirement, functions and deficiency disease symptoms of Macrominerals (Ca, P, and Cl) and microminerals/trace elements (I, Fe, Zn and Se).

UNIT-3 Dietetics and Diet Therapy   14 Hrs

Food pyramid; Diet planning and introduction to diet therapy. Nutritional requirements for different age groups, anemic child, expectant women, and lactating women. Diet planning for prevention and cure of nutritional deficiency disorders.

Diet therapy: Functional foods, Anthropometric measurements, dietary considerations during fever, malaria, and tuberculosis. Prevention and correction of obesity, underweight, and metabolic diseases by diet therapy. Dietary interventions to correct and/or manage the gastro-intestinal diseases (indigestion, peptic ulcer, constipation, diarrhoea, steatorrhoea, irritable bowel syndrome. Functional food-based diet therapy for diabetes, cardiovascular disease and cancer.

REFERENCES:

1. Clinical Dietetics and Nutrition, 2002, 4th Edition, Antia FP and Abraham P, Oxford University Press; ISBN-10: 9780195664157.
2. Oxford Handbook of Nutrition and Dietetics, 2011, Webster-Gandy J, Madden A and Holdsworth M. Oxford University Press, Print ISBN-13:9780199585823.
3. Krause's Food, Nutrition and Diet therapy, 2003, Mahan KL and Escott-Stump S., Elsevier, ISBN: 9780721697840.
4. Human Nutrition and Dietitics.1986, Passmore R. and Davidson S. Churchill Livingstone Publications, ISBN-10: 0443024863.
5. Rosemary Stanton's Complete Book of Food & Nutrition, 2007, Simon & Schuster Publishers, Australia, ISBN 10: 0731812999
6. Food Science and Nutrition, 2018, Roday S.Oxford University Press Publishers, ISBN: 9780199489084/0199489084.
7. Food Science, 2007, Srilakshmi S. New Age International (P) Limited Publishers, ISBN: 9788122420227/ 8122420222.

Pedagogy: Mooc/Lectures/book chapter/problem solving/assignment

Formative Assessment	
Assessment occasion	**Weightage in marks**
Class test (2 class tests)	**20**
Seminars/class work	**10**
Assignment/open discussion	**10**
Total	**40**

Biochemistry *Open Elective*-2 for Second Semester

Course title	Proteins and Enzymes
Course credits	03
Total contact hours	42
Duration of end semester examination	2.5 h
Formative assessment marks	40
Summative assessment marks	60

Course Outcome:

Proteins:

1. The course aims to introduce proteins and their importance to modern Biochemistry, highlighting their structural features and unique characteristics that help them participate in every physiological process in life.

Enzymes:

2. The objective of this course is to integrate the practical aspects of enzymology with the kinetic theories to provide a mechanistic over view of enzyme activity and regulation in the cell.

3. To prepare students to confidently and competently work with enzyme systems in both Academia and industry.

UNIT - 1	14 hrs

Classification of amino acids, Zwitter ion structure, Isoelectric point, pKa. Properties of peptide bond. Classification of proteins based on structure and functions. Overview of Primary, Secondary, Tertiary and Quaternary structures of proteins. Structure of myoglobin and hemoglobin, Ramachandran plot, Helices, sheets and turns

Determination of primary structure of proteins, determination of N-terminal amino acid (by DNFB and Edman method), and C- terminal amino acid (by thiohydantoin and with carboxy peptidase enzyme). Over view on protein folding.

UNIT – 2	14 hrs

Introduction of Biocatalysts, Nomenclature and classification of enzymes, enzyme specificity, Active site and its models, fundamentals of enzyme assay.

Enzyme Kinetics: Order of reactions, Michalis–Menten equation for Uni-Substrate reaction (derivation not necessary), significance of Km and Vmax

Enzyme inhibition: Over view on Reversible and irreversible inhibition

Regulation of enzyme activity: Allosterism and cooperativity, feedback inhibition.

Outline of Mechanism of enzyme action: Acid – base catalysis, covalent catalysis, and electrostatic catalysis. Mechanism of Chymotrypsin.

Applications of enzymes.

UNIT – 3	14 hrs

Separation and characterization of Proteins and enzymes: Ammonium sulphate fractionation, solvent fractionation, dialysis and lyophylization , Ion exchange chromatography, molecular sieve chromatography, affinity chromatography, Native and SDS – PAGE electrophoresis.

REFERENCES

1. Lehninger Principles of Biochemistry, 6th Edition , David L Nelson, 2017

2. Fundamentals of Biochemistry, 4th Edition , Donald Voet and Judith Voet , 2015

3. Biochemistry Jeremy Berg , Lubert Stryer and John Tymoczko, Gregory Gatto, 2019

4. Protein Purification. Principles and Practice. Robert K Scopes, Springer, ISBN 978-1-4737-2333-5

Pedagogy: Mooc/Desk Work/Book Chapter/Problem Solving /Assignment

Formative Assessment	
Assessment occasion	**Weightage in marks**
Class test (2 class tests)	**20**
Seminars/class work	**10**
Assignment/open discussion	**10**
Total	**40**

Model question paper pattern for End semester Theory Examination

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Time: 2.5 h   **Max. Marks: 60**

Note: all sections are compulsory

SECTION – A

1. Answer *any five* of the following;   5x2= 10
    a)
    b)
    c)
    d)
    e)
    f)
    g)

SECTION –B

Answer *any five* of the following;   5x4=20

2.
3.
4.
5.
6.
7.

SECTION – C

Answer *any three* of the following;   3x10=30

8.
9.
10.
11.

- *Note: Section- C shall include sub questions a and b either for 5+5 or 6+4*

Model question paper for end semester practical examination

Time: 3 h   **Max. Marks: 25**

1. Marks for procedure writing   5 Marks
2. Marks for Viva – Voce   5 Marks
3.Marks for performing experiment   15 Marks

ಬೆಂಗಳೂರು ಉತ್ತರ ವಿಶ್ವವಿದ್ಯಾಲಯ

ಟಮಕ, ಕೋಲಾರ – 563103

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: BIOTECHNOLOGY

2021-22 onwards

BENGALURU NORTH UNIVERSITY
ಬೆಂಗಳೂರು ಉತ್ತರ ವಿಶ್ವವಿದ್ಯಾಲಯ

Syllabus for B.Sc. Biotechnology (UG)

CHOICE BASED CREDIT SYSTEM (CBCS)
I & II Semester Biotechnology Papers

Under-Graduate (UG) Program
Framed According to the National Education Policy (NEP 2020)

From the academic year 2021-22

MODEL CURRICULUM

Name of the Degree Program: BSc (Basic/Hons.)
Discipline Core: Biotechnology
Total Credits for the Program: B.Sc. Basic - 136 and B.Sc. Hons. - 176
Starting year of implementation: 2021-22

Program Outcomes: Competencies need to be acquired by the candidate for securing B.Sc. (Basic) or B.Sc. (Hons)

Introduction:

The NEP-2020 offers an opportunity to effect paradigm shift from a teacher-centric to student-centric higher education system in India. It caters skill based education where the graduate attributes are first kept in mind to reverse-design the programs, courses and supplementary activities to attain the graduate attributes and learning attributes. The learning outcomes-based curriculum framework for a degree in **B.Sc. (Honours) Biotechnology** is intended to provide a comprehensive foundation to the subject and to help students develop the ability to successfully continue with further studies and research in the subject while they are equipped with required skills at various stages. Effort has been made to integrate use of recent technology and use of MOOCs to assist teaching-learning process among students. The framework is designed to equip students with valuable cognitive abilities and skills so that they are successful in meeting diverse needs of professional careers in a developing and knowledge-based society. The curriculum framework takes into account the need to maintain globally competitive standards of achievement in terms of knowledge and skills in **Biotechnology** and allied courses, as well develop scientific orientation, spirit of enquiry, problem solving skills, human and professional values which foster rational and critical thinking in the students. This course serves a plethora of opportunities in different fields right from classical to applied aspects in **Biotechnology**.

RADUATE ATTRIBUTES IN B.Sc. (Hons.) Biotechnology

Some of the characteristic attributes a graduate in **Biotechnology** should possess are:

• Disciplinary knowledge and skills
• Skilled communication
• Critical thinking and problem solving capacity
• Logical thinking and reasoning
• Team Spirit & Leadership Quality
• Digital efficiency
• Ethical awareness / reasoning
• National and international perspective
• Lifelong learning

Flexibility:

- The programmes are flexible enough to allow liberty to students in designing them according to their requirements. Students may choose a single Major, one Major with a Minor, and one Major with two Minors. Teacher Education or Vocational courses may be chosen in place of Minor/s below listed are the various options students may choose from.

- One Major subject/discipline, Two Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities.

- One Major and one Minor subject/discipline along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities

- Two Major subject/disciplines along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses, including Extracurricular Activities.

- One Major subject/discipline and one Vocational course along with Languages, Generic Electives, Ability Enhancement and Skill Development and courses including Extracurricular Activities.

- One Major Discipline and One Education Discipline along with Languages, Generic Electives, Ability Enhancement and Skill Development Courses including Extracurricular Activities.

By the end of the program the students will be able to:

- Understand concepts in Biotechnology and demonstrate interdisciplinary skills acquired in cell biology, genetics, biochemistry, microbiology and molecular biology.

- Demonstrate the laboratory skills in cell biology, basic and applied microbiology with an emphasis on technological aspects.

- Competent to apply the knowledge and skills gained in the fields of Plant biotechnology, animal biotechnology and microbial technology in pharma, food, agriculture, beverages, herbal and nutraceutical industries.

- Critically analyze the environmental issues and apply the knowledge gained in biotechnology for conserving the environment and resolving the problems.

3

- Demonstrate comprehensive innovations and skills in the field of biomolecules, cell biology molecular biology, bioprocess engineering and genetic engineering of plants, microbes, and animals with respect to applications for human welfare.

- Apply knowledge and skills of immunology, bioinformatics, computational modelling of proteins, drug design and simulations to test the models and aid in drug discovery.

- Critically analyze, interpret data, and apply tools of bioinformatics and multi omics in various sectors of biotechnology including health and food.

- Demonstrate communication skills, scientific writing, data collection and interpretation abilities in all the fields of Biotechnology.

- Learn and practice professional skills in handling microbes, animals and plants and demonstrate the ability to identify ethical issues related to recombinant DNA technology, genetic engineering, animal handling, intellectual property rights, biosafety, and biohazards.

- Explore the biotechnological practices and demonstrate innovative thinking in addressing the current day and future challenges with respect to food, health, and environment.

- Gain thorough knowledge and apply good laboratory and good manufacturing practices in biotech industries.

- Understand and apply molecular biology techniques and principles in forensic and clinical biotechnology.

- Demonstrate entrepreneurship abilities, innovative thinking, planning, and setting up of small-scale enterprises or CROs.

Assessment: Weightage for assessments

Type of Course	Formative Assessment / IA	Summative Assessment
Theory	40	60
Practical	25	25
Projects	40	60
Experiential Learning (Internships/MOOC/ Swayam etc.)	40	60

Progressive Certificate, Diploma, Bachelor's Degree or Bachelor's Degree with Honours provided at the end of each year of exit of the four-years Undergraduate Programme.

	EXIT OPTIONS	Credits Required
1.	**Certificate** upon the successful completion of the First Year (Two Semesters) of the multidisciplinary Four-years Undergraduate Programme/Five-years Integrated Master's Degree Programme.	44-48
2.	**Diploma** upon the successful completion of the Second Year (Four Semesters) of the multidisciplinary Four-years Undergraduate Programme/Five-years Integrated Master's Degree Programme.	88-96
3.	**Basic Bachelor's Degree** at the successful completion of the Third Year (Six Semesters) of the multidisciplinary Four-year Undergraduate Programme/Five-years Integrated Master's Degree Programme.	132-144
4.	**Bachelor's Degree with Honours** in a Discipline at the Successful Completion of the Fourth Year (Eight Semesters) of the multidisciplinary Four-years Undergraduate Programme/Five-years Integrated Master's Degree Programme	176-192

IIA. Model Program Structures for the Under-Graduate Programs in Bengaluru City University and its affiliated Colleges.

Biotechnology

Semester	Discipline Core (DSC) (Credits) (L+T+P)	Discipline Elective(DSE) / Open Elective (OE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC),Languages (Credits) (L+T+P)		Skill Enhancement Courses (SEC)		Total Credits
					Skill based (Credits) (L+T+P)	Value based (Credits) (L+T+P)	
I	DSC: T1 BTC 101 A1- Cell biology and Genetics (04) DSC-P1 BTC 101 Cell biology and Genetics (02)	OE-T1, BTC 301 Biotechnology for Human Welfare (03)	L1-1(3), L2-1(3) (4 hrs. each)		SEC-T1, BTC -701, Biotechnological Skills and Analytical Techniques (1+0+2)	Physical Education for Health &Wellness fitness (1)(0+0+2)(1) (0+0+2)	25
II	DSC-T2 BTC 102 A2- Microbiological Methods (04) DSC-P2 BTC 102 Microbiological Methods (02)	OE-T2, BTC 302 Applications of Biotechnology in Agriculture (03)	L1-2(3), L2-2(3) (4 hrs. each)	Environ mental Studies (2)	---------	Physical Education - NCC/NSS/R&R (S&	25
Exit option with Certificate in Biotechnology (50 Credits)							

B.Sc. Biotechnology (Basic / Hons.), First Semester

Course Title: DSC-T1BTC101, Cell Biology and Genetics (A1)	
Course Code: **DSC-T1BTC101**	L-T-P per week: 4-0-0
Total Contact Hours: **56**	Course Credits: 0**4**
Formative Assessment Marks: **40**	Duration of ESA/Exam: 0**3 h**
Model Syllabus Authors: **Curriculum Committee**	Summative Assessment Marks: **60**

Course Outcomes (COs): At the end of the course the students will be able to:
1. Understand concepts in Biotechnology and demonstrate knowledge acquired in interdisciplinary skills in cell biology and genetics
2. Comprehend the structure of a cell with its organelles
3. Understand the chromatin structure and its location
4. Understand the basic principles of life, and how a cell divides
5. Explain the organization of genes and chromosomes, chromosome morphology and its aberrations

Course Articulation Matrix: Mapping of Course Outcomes (Cos) with Program Outcomes (Pos 1-12)

Sl. No	Course Outcomes (COs) / Program Outcomes (POs)	T1	1	2	3	4	5	6	7	8	9	10	11
I	Core competency	X											
II	Critical thinking	X											
III	Analytical reasoning	X											
IV	Research skills	X											
V	Team work	X											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

B.Sc. Biotechnology (Basic / Hons.), First Semester

Content of Course 01: Theory: DSC-T1BTC101: Cell Biology and Genetics	56 h
Unit-1: Cell and cellular organelles	**14 h**
Historical perspectives. Discovery of cell, the cell theory, ultra structure of a eukaryotic cell- (both plant and animal cells), structural organization and functions of cell wall and plasma membrane. **Structure and functions of cell organelles:** Cytosol, endoplasmic reticulum, Golgi complex, mitochondria, chloroplast, ribosomes, lysosomes, peroxisomes, nucleus, nucleolus, vacuole and cytoskeletal structures (microtubules, microfilaments and intermediate filaments).	
Unit-2: Chromosomes and cell division	**14 h**
General introduction, discovery, morphology and structural organization – Centromere, secondary constriction, telomere, chromonema, euchromatin and heterochromatin, chemical composition and karyotype. Single-stranded and multi-stranded hypothesis, folded-fibre and nucleosome models. **Special type of chromosomes:** Salivary gland chromosome and lampbrush chromosmes. Cell cycle, phases of cell division, mitosis and meiosis, cell cycle checkpoints, enzymes involved in regulation, cell signaling cell communication. significance of cell cycle, achromatic apparatus, synaptonemal complex, senescence and programmed cell death.	
Unit-3: Inheritance and gene interaction	**14 h**
History of genetics: Mendelian theory; Laws of inheritance - dominance, segregation, incomplete dominance, codominance with an example. Law of independent assortment, test cross, back cross and non-Mendelian inheritance. **Maternal inheritance:** Plastid inheritance in Mirabilis, Kappa particles in paramecium, and Petite characters in yeast, Sex-linked inheritance, Chromosome theory of inheritance. **Gene interaction:** Supplementary factors: comb pattern in fowls, Complementary genes – flower colour in sweet peas, Multiple factors – skin colour in human beings, Epistasis – plumage colour in poultry, Multiple allelism: blood groups in human beings.	
Unit-4: Linkage and mutation	**14 h**
General introduction, coupling and repulsion hypothesis, linkage in maize and Drosophila, mechanism of crossing over and its importance, chromosome mapping-linkage map in maize. **Mutations:** Types of mutations; spontaneous and induced mutagens: Physical and chemical, mutation at the molecular level, mutations in plants, animals and microbes and its merits and demerits. Structural and numerical chromosomal aberrations. Sex determination in plants and animals. Concept of allosomes and autosomes, XX-XY, XX-XO, ZW-ZZ, ZO-ZZ types. Allosomal (Klinefelter syndrome and Turner's syndrome), autosomal (Down's syndrome and Cri-Du-Chat syndrome) conditions.	

Formative Assessment

Pedagogy: Lectures, Presentations, videos, Assignments and Weekly Formative Assessment Tests.	
Assessment Occasion	**Weightage in marks**
Assignment/ Field Report/ Project	15 Marks
Test	20 Marks
Participation in class	05 marks
Total	**40 Marks**

Cell Biology and Genetics Laboratory Content

Course content 01: Practicals: DSC-P1BTC101: Cell Biology and Genetics

Course Title: **Cell Biology and Genetics**	Course Credits: **02**
Course Code: **DSC-P1BTC101**	L-T-P per week: 0-0-4
Total Contact Hours: **28**	Duration of ESA/Exam: 03 h
Formative Assessment Marks: **25**	Summative Assessment Marks: **25**

1. Operation and working principle of simple and compound microscope.
2. Use of Micrometry, measurement of onion epidermal cells and yeast.
3. Study of mitosis in onion root tips.
4. Study of meiosis in grasshopper testes/onion/Rhoeo flower buds.
5. Mounting of polytene chromosomes.
6. Buccal smear – Barr bodies.
7. Karyotype analysis – human (normal & abnormal) and onion.
8. Isolation and staining of mitochondria/chloroplast.
9. Enumeration of RBC using Haemocytometer.
10. Simple genetic problems based on theory.
11. Preparation and submission of 5 permanent slides of mitosis & meiosis (by each student).

Pedagogy: Lectures, Presentations, videos, Assignments and Weekly Formative Assessment Tests.

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
Assignment/Monograph	10
Test	10
Participation in class	05
Total	**25**

Text Books/References

1. Ambrose, and Dorothy, M., Easty 1970. Cell Biology, ELBS Publications.
2. Benjamin Lewin, 1985. Genes II –Wiley & Sons Publications.
3. Benjamin Lewin, 1987. Genes III Wiley & Sons Publications.
4. Benjamin Lewin, 1994. Genes V. By Oxford University Press, Oxford and New York, 1,272 pp.

5. Bruce Alberts, Alexander Johnson, Julian Lewis, et al., 2014 Molecular Biology of Cell –Garland publications.
6. Daniel L. Hartl, E.W. Jones, Jones, 2005. Genetics: Analysis of Genes and Genomes, Barlett Publishers.
7. De Robertis and EMF Robertis, 1980. Cell Biology & Molecular Biology – EDP Saunder College.
8. Edgar Altenburg, 1970. Genetics, Oxford & IBH publications.
9. Gardener, E.J., Simmons M.J. and Snustad D.P. 1991. Principles of Genetics –John Wiley and Son Publications.
10. Gupta P.K., 2018-19. Genetics - 5th Revised Edition, Rastogi Publication, Meert, India.
11. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. 2000. Molecular Cell Biology - Daniel, Scientific American Books.
12. Jack D Bruke. 2002. Cell Biology, The William Twilkins Company.
13. Monroe W Strickberger, 1976. Genetics, Macmillain Publishers, New York
14. Powar, C.B. 2019. Cell Biology, Himalaya Publications.
15. Sandy, B. Primrose, Richard Twyman, 2006. Principles of Gene Manipulations 7th Edition Black Well Scientific Publications.
16. Sharp, L.W. 1943. Fundamentals of Cytology - New York,McGraw-Hill Book Company, inc.
17. Sinnott, L.C. Dunn, Dobzhansky 1985. Principles of Genetics - McGraw-Hill.
18. White, M.J.D. 1980. Animal Cytology and Evolution, Cambridge University Publications.
19. Willson and Marrison, 1966. Cytology, Reinform Publications.

Content of Course 02: Theory: OE-T1 BTC301: Biotechnology for Human Welfare

Course Title: Biotechnology for Human Welfare	Course Credits: 03
Course Code: OE-T1BTC301	L-T-P per week: 3-0-0
Total Contact Hours: 42	Duration of ESA/Exam: 3 h
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit – 1: Industry	14 h
Enzymes for textile industry, breweries, food supplements – single cell protein, vitamins, food processing - cheese, yoghurt making, biodegradable plastics, biofuels.	
Unit – 2: Environment	**14 h**
Applications of Biotechnology in environmental aspects: waste management, biodegradation of heavy metals, water cleaning, removing oil spills, air and soil pollution, bioremediation, biomining.	
Unit – 3: Human Health and livestock	**14 h**
Applications in Human Health: Antibiotic production, Molecular diagnostics, vaccines and vaccine delivery, recombinant therapeutics – insulin, gene therapy, forensics. **Applications in livestock improvement:** transgenic animals, animal vaccine production, Increased milk production, artificial insemination, poultry and fisheries.	

Text Books/References

1. Bhasin, M.K. and Nath, S. 2002. Role of Forensic Science in the New Millennium, University of Delhi,
2. Crueger Wand Crueger, A. 2000. Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
3. Eckert, W.G. and Wrightin, R.K. 1997. Introduction to Forensic Sciences, 2nd Edition, CRC Press, Boca Raton.
4. Hans-Joachim Jordening and Jesef Winter, 2005. Environmental Biotechnology Concepts and Applications.
5. James, S.H. and Nordby, J.J. 2005. Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton.
6. Nanda, B.B. and Tiwari, R.K. 2001. Forensic Science in India: A Vision for the Twenty First Century, Select Publishers, New Delhi
7. Patel, A.H. 1996. Industrial Microbiology.1st edition, Macmillan India Limited.
8. Pradipta Kumar Mohapatra, 2020. Environmental Biotechnology, Dreamtech Press.
9. Stanbury, P.F., Whitaker, A. and Hall, S.J. 2006. Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	15
Written Assignment/Presentation/Project / Term Papers/Seminar	10
Class performance/Participation	05
Total	30

Skill Enhancement Course in Biotechnology
Course 03: Theory: SEC-T1BTC701, Biotechnology Skills &Analytical Techniques

Learning Outcomes:

- Demonstrate skills as per National Occupational Standards (NOS) of "Lab Technician/Assistant" Qualification Pack issued by Life Sciences Sector Skill Development Council-LFS/Q0509, Level3.
- Skills enhancement as per National Occupational Standards (NOS) of "Lab Technician/Assistant" Qualification Pack issued by Life Sciences Sector Skill Development Council-LFS/Q0509, Level 3.
- Knowledge about major activities of biotech industry, regulations and compliance, environment, health and safety (EHS), good laboratory practices (GLP), standard operating procedures (SOP) and GMP as per the industry standards.
- Demonstrate soft skills, such as decision making, planning, organizing, problem solving, analytical thinking, critical thinking and documentation.

Course content:03 theory Course Title: SEC-T1BTC701: Biotechnology Skills &Analytical Techniques		
Total Contact Hours: 14 Hours	Duration of ESA:**01**Hrs.	
Formative Assessment Marks: 10	Summative Assessment Marks: 15	
Insights into biotechnology industry: Biotechnology Industry in Indian and Global context- organization in context of large/medium/small enterprises, their structure and benefits. **Industry oriented professional skills to be acquired:** Planning and organizing skills, decision-making, problem-solving skills, analytical thinking, critical thinking, team management, risk assessment. **Interpersonal skills:** Writing skills, reading skills, oral communication, conflict-resolution techniques, interpretation of research data, trouble shooting in workplace **Digitals kills:** Basic computer skills (MS Office, excel, power point, internet) for workplace. Professional E-mail drafting skills and power point presentation skills **Analytical skills in laboratory: Solutions:** molarity, molality, normality, mass percent % (w/w), percent by volume (%v/v), parts per million (ppm), parts per billion (ppb), dilution of concentrated solutions. Standard solutions, stock solution, solution of acids. Reagent bottle label reading and precautions	14 h	

Course content:03	
Course Title: **SEC-P1BTC701**: **Biotechnological Skills & Analytical Techniques**	
Total Contact Hours: 28 Hours	Duration of ESA:02Hrs.
Formative Assessment Marks: 25	Summative Assessment Marks: 25

1. **Methods and practices of cleaning and management of lab:** Learning and Practice of Integrated clean-in-place (CIP) and sterilize-in-place (SIP) as per industry standards, material requirements for cleaning specific area, equipment, ventilation area, personal protective requirements

2. **Procedure of cleaning and storage of lab ware:** Methodology for storage area, cleaning procedure and materials to be used for various surfaces. Signboards, labelling do's & don'ts Knowledge about standard procedures of cleaning or glass ware, plastic ware. Maintenance of inventor

3. **Principles and practices of lab safety:** Knowledge about safety symbols and hazard signs. Personal safety gears, utility, and disposal. Equipment safety protocols, chemical safety protocols. Documentation of chemical and equipment usage records. Handling hazardous chemicals.

4. **Best practices of usage and storage of chemicals:** Knowledge and practice in handling of chemicals, labeling and stock maintenance. SOP and material handling. Procedures to maintain chemicals, labelling, storage and disposal.

5. **Record maintenance as per SOP's:** Labelling of samples and reagents as per SOP's. Recording detail's of work done for research experiments. Importance of study of manuals, health and safety instructions.

6. **Usage and maintenance of basic equipments of biotechnology lab**: Principles, calibrations and SOPs of weighing balances, pH meters, autoclaves, laminar flows and biosafety cabinets, basic microscopes, homogenizers, stirrers, colorimeters, UV and visible spectrophotometers.

7. **Preparation of solutions and standards -** Properties and uses of chemicals commonly used in life science laboratories. Maintaining safety standards for handling various solutions and chemicals. Preparation of test reagents and buffers. Protocols for proper mixing of chemicals. Safety precautions while preparation and storage of incompatible chemicals and reagents.

8. **Preparation of media**: Maintenance and storage of purified water for media (plant tissue culture media, microbiological media and animal cell culture media) preparation. Preparation and storage of concentrated stock solutions. Documentation and disposal of expired stocks. Collection of indents of media requirement, preparation, and storage. Media coding, documentation and purpose of usage.

9. **Practical methods for decontamination and disposal:** Decontamination methods, safe disposal practices of decontaminated media or materials.

10. **Laboratory record writing:** Method of record writing, data collection and recording, reporting of result, discussion of result, summary writing, effective power point presentation taking any experiment as example.

11. Industry visit or analytical laboratory visit

Pedagogy: Lectures, Presentations, videos, Assignments and Weekly Formative Assessment Tests.

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
Assignment/Monograph	10
Test	10
Participation in class	05
Total	**25**

B.Sc. Biotechnology (Basic / Hons.), Second Semester

Course Title: DSC-T2, BTC102, Microbiological Methods (A2)	
Course Code: **DSC-T2BTC102**	L-T-P per week: 4-0-0
Total Contact Hours: **56**	Course Credits: 0**4**
Formative Assessment Marks: **40**	Duration of ESA/Exam: 0**3 h**
Model Syllabus Authors: **Curriculum Committee**	Summative Assessment Marks: **60**

Course Outcomes (COs): At the end of the course the students will be able to:

Course Articulation Matrix: Mapping of Course Outcomes (Cos) with Program Outcomes (Pos 1-12)

Sl. No	Course Outcomes (COs) / Program Outcomes (POs)	T1	1	2	3	4	5	6	7	8	9	10	11
I	Core competency	X											
II	Critical thinking	X											
III	Analytical reasoning	X											
IV	Research skills	X											
V	Team work	X											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

B.Sc. Biotechnology (Basic / Hons.), Second Semester

Content of Course 01: Theory: DSC-T2BTC102: Microbiological Methods	56 h
Unit – 1: Instrumentation	**14 h**
Microscopy: Principles of Microscopy-resolving power, numerical aperture, working principle and applications of light, compound microscope, Dark field microscope, Phase contrast microscope, Fluorescence microscope, confocal microscope. Electron microscopes - TEM and SEM. **Analytical techniques:** Working principle and applications: centrifuge, ultracentrifuge, spectrophotometer, chromatography: paper and TLC.	
Unit – 2: Sterilization techniques	**14 h**
Definition of terms - sterilization, disinfectant, antiseptic, sanitizer, germicide, microbicidal agents, microbiostatic agents and antimicrobial agents. **Physical methods of control:** Principle, construction and applications of moist heat sterilization Boiling, Pasteurization, Fractional sterilization - Tyndallization and autoclave. Dry heat sterilization – Incineration and hot air oven. Filtration–Diatomaceous earth filter, Seitz filter, membrane filter and HEPA; Radiation: Ionizing radiation – γ-rays and non-ionizing radiation – UV rays **Chemical methods:** Alcohols, aldehydes, phenols, halogen, metallic salts, Quaternary ammonium compounds and sterilizing gases as antimicrobial agents.	
Unit – 3: Microbiological techniques	**14 h**
Culture Media: Components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media **Pure culture methods:** Serial dilution and plating methods (pour, spread, streak); cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria **Stains and staining techniques:** Principles of staining, Types of stains-simple stains, structural stains and differential stains.	
Unit – 4: Antimicrobial agents and assessment of antimicrobial activity	**14 h**
Modes of action of antimicrobial agents: Antifungal agents; Amphotericin B, Griseofulvin Antiviral agents; Amantadine, Acyclovir, Azidothymine Antibacterial agents; Plazomicin, Ervacycline, Omadacyclin and imipenum Challenges in antimicrobial therapy; Emergence of resistance (MDR, XDR) **Assessment of antimicrobial activity:** Antibacterial- Disc and agar well diffusion techniques, Microdilution method, Zones of inhibition, MBC, Determination of IC 50. Antifungal- Determination of MFC, Time kill kinetics assay, sorbitol assay, Antiviral- CPE, virus yield reduction assay, TCID, Neutralization assay, Haemagglutination inhibition.	

Formative Assessment	
Assessment Occasion	**Weightage in marks**
Assignment/ Field Report/ Project	15 Marks
Test	20 Marks
Participation in class	05 marks
Total	**40 Marks**

Course 01: Practicals: DSC-P2BTC102: Microbiological Methods

Course Title: **Microbiological Methods**	Course Credits: **02**
Course Code: **DSC-P2BTC102**	L-T-P per week: 0-0-4
Total Contact Hours: **28**	Duration of ESA/Exam: 03 h
Formative Assessment Marks: **25**	Summative Assessment Marks: 2**5**

1. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology and biotechnology laboratory.
2. Sterilization of media using autoclave and assessment for sterility.
3. Sterilization of glass wares using hot air oven and assessment for sterility.
4. Sterilization of heat sensitive material by membrane filtration and assessment for sterility.
5. Preparation of culture media for bacteria, fungi and their cultivation.
6. Plating techniques: Spread plate, pour plate and streak plate.
7. Isolation of bacteria and fungi from soil, water and air.
8. Study of *Rhizopus*, *Penicillium*, *Aspergillus* using temporary mounts.
9. Colony characteristics study of bacteria from air exposure plate.
10. Staining techniques: Bacteria – gram, negative, capsule, endospore staining and Fungi – Lactophenol cotton blue staining.
11. Water analysis – MPN test.
12. Biochemical Tests – IMViC, starch hydrolysis, catalase test, gelatin hydrolysis.
13. Bacterial cell motility – hanging drop technique

Pedagogy: Lectures, Presentations, videos, Assignments and Weekly Formative Assessment Tests.

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
Assignment/Monograph	10
Test	10
Participation in class	05
Total	**25**

Text Books/References

1. Atlas, R.M. 1997. Principles of Microbiology. 2nd edition. WM.T. Brown Publishers.
2. Black, J.G. 2008. Microbiology: Principles and Explorations. 7th edition. Prentice Hall Bull, A.T. 1987. Biotechnology, International Trends of perspectives.
3. Cappucino, J. and Sherman, N. 2010. Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited.
4. Frobisher, Saunders and Toppan 1974. Fundamentals of Microbiology Publications
5. Madigan, M.T, and Martinko, J.M. 2014. Brock Biology of Micro-organisms. 14th

edition. Parker J. Prentice Hall International, Inc.

6. Paul A. Ketchum, 1988. Microbiology, Concepts and applications, Wiley Publications.
7. Pelczar Jr M.J., Chan, E.C.S. and Krieg, N.R. 2004. Microbiology. 5th edition Tata McGraw Hill.
8. Salley, 1984. Fundamentals of Bacteriology, Tata McGraw Hill Education.
9. Singh, R.B. 1990. Introductory Biotechnology, C.B.D. India
10. Srivastava, S and Srivastava, P.S. 2003. Understanding Bacteria. Kluwer Academic Publishers, Dordrecht.
11. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 2005. General Microbiology. 5th edition McMillan.
12. Tortora, G.J., Funke, B.R. and Case, C.L. 2008. Microbiology: An Introduction. 9th edition Pearson Education.
13. Willey, J.M., Sherwood, L.M. and Woolverton, C.J. 2013. Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

Content of Course 02: Theory: OE-T2BTC302: Applications of Biotechnology in Agriculture

Course Title: Applications of Biotechnology in Agriculture	Course Credits: 03
Course Code: OE-T2MBL302	L-T-P per week: 0-0-3
Total Contact Hours: 42h	Duration of ESA/Exam: 3h
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit – 1: Agricultural Biotechnology	**14 h**
Soil and air as a major component of environment. Types, properties and uses of soil and air. Distribution of microorganisms in soil and air. Major types of beneficial microorganisms in soil. Major types of harmful microorganisms in soil.	
Unit – 2: Transgenic plants	**14 h**
The GM crop debate – safety, ethics, perception and acceptance of GM crops, GM crops case study: Bt-cotton, Bt-brinjal Plants as bio-factories for molecular pharming: edible vaccines, plantibodies, nutraceuticals.	
Unit – 3: Biofertilizers & Bio pesticides	**14 h**
Biofertiizers; Advantages and brief account on Rhizobium, BGA and phosphate solubilizers. Baculovirus pesticides, Myco pesticides, Post - harvest protection: Antisense RNA technology for extending shelf life of fruits and shelf life of flowers. Genetic Engineering for quality improvement: Seed storage proteins, Flavours - capsaicin, vanillin	

Text Books/References
1. Chrispeels, M.J. et al. 1994. Plants, Genes and Agriculture-Jones and Bartlett Publishers, Boston.
2. Gamborg, O.L. and Philips, G.C. 1998. Plant cell, tissue and organ culture (2nd ed.) Narosa Publishing House. New Delhi.

3. Gistou, Pand Klu, H. 2004. Hand book of Plant Biotechnology (Vol.I & II). John Publication.
4. Hammound, J.P McGravey and Yusibov. V. 2000. Plant Biotechnology, Springer verlag.
5. Heldt. 1997. Plant Biochemistry and Molecular Biology. Oxford and IBH Publishing Co. Pvt. Ltd. Delhi.
6. Lydiane Kyte and John Kleyn. 1996. Plants from test tubes. An introduction to Micropropagation (3rd ed.). Timber Press, Portland.
7. Murray, D.R. 1996. Advanced methods in plant breeding and biotechnology. Panima Publishing Corporation.
8. Nickoloff, J.A. 1995. Methods in molecular biology, Plant cell electroporation and electro fusion protocols – Humana pressin corp, USA.
9. Sawahel, W.A. 1997. Plant genetic transformation technology. Daya Publishing House, Delhi.

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminars, Field visit

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	15
Written Assignment/Presentation/Project / Term Papers/Seminar	10
Class performance/Participation	05
Total	30

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ಟಮಕ, ಕೋಲಾರ – 563103

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: COMPUTER SCIENCE

2021-22 onwards

BENGALURU NORTH UNIVERSITY
KOLAR - 563103

National Education Policy - 2020
(Semester Scheme)

Model Curriculum Structure for Bachelor of Science
(Basic and Honours) Programmes with Computer Science
as Major and Minor Courses.

Model Syllabus for I and II Semester
and
Open Elective Courses in Computer Science.

Revised w.e.f.

Academic Year 2021 - 2022 and onwards

Program: BSc (Basic and Honors)   Subject: Computer Science

1. Computer Science as MAJOR with another Subject as MINOR (Table IIA of Model Curriculum)

Sem	Discipline Specific Core Courses (DSC)	Hour of Teaching/ Week		Discipline Specific Elective Courses (DSE)/ Vocational Courses (VC)	Hour of Teaching/ Week
		Theory	Lab		
1	DSC-1: Computer Fundamentals and Programming in C	4			
	DSC-1Lab: C Programming Lab		4		
2	DSC-2: Data Structures using C	4			
	DSC-2Lab: Data structures Lab		4		
3	DSC-3: Object Oriented Programming Concepts and Programming in JAVA	4			
	DSC-3Lab: JAVA Lab		4		
4	DSC-4: Database Management Systems	4			
	DSC-4Lab: DBMS Lab		4		
5	DSC-5: Programming in PYTHON	3		VC-1: Any one from Vocational Courses, Group – 1*	3
	DSC-6: Computer Networks	3			
	DSC-5Lab: PYTHON Programming lab		4		
	DSC-6Lab: Computer Networks Lab		4		
6	DSC-7: Internet Technologies	3		VC-2: Any one from Vocational Courses, Group – 2*	3
	DSC-8: Operating System Concepts	3			
	DSC-7Lab: JAVA Script, HTML, CSS Lab		4	Internship:	2
	DSC-8Lab: C# Programming Lab		4		
7	DSC-9: Computer Graphics and Visualization	3		DSE-1: Any one from Discipline Specific Elective Courses, Group – 1**	3
	DSC-10: Design and Analysis of Algorithms	3			
	DSC-11: Software Engineering	3		DSE-2: Any one from Discipline Specific Elective Courses, Group – 2**	3
	DSC-9Lab: Computer Graphics and Visualization Lab		4		
	DSC-10Lab: Algorithms Lab		4	Research Methodology:	3
8	DSC-12: Artificial Intelligence and Applications	3		DSE-3: Any one from Discipline Specific Elective Courses, Group – 3**	3
	DSC-13: Computer Organization and Architecture	3			
	DSC-14: Data Warehousing and Data Mining	3			
	DSC-12Lab: AI Lab		4	Research Project:	6

2. Computer Science as MAJOR with another Subject also as MAJOR (Table IIIA of Model Curriculum)

Sem	Discipline Specific Core Courses (DSC)	Hour of Teaching/ Week Theory	Lab	Discipline Specific Elective Courses (DSE)	Hour of Teaching/ Week
1	DSC-1: Computer Fundamentals and Programming in C	4			
	DSC-1Lab: C Programming Lab		4		
2	DSC-2: Data Structures using C	4			
	DSC-2Lab: Data structures Lab		4		
3	DSC-3: Object Oriented Programming Concepts and Programming in JAVA	4			
	DSC-3Lab: JAVA Lab		4		
4	DSC-4: Database Management Systems	4			
	DSC-4Lab: DBMS Lab		4		
5	DSC-5: Programming in PYTHON	3			
	DSC-6: Computer Networks	3			
	DSC-5Lab: PYTHON Programming lab		4		
	DSC-6Lab: Computer Networks Lab		4		
6	DSC-7: Internet Technologies	3			
	DSC-8: Operating System Concepts	3			
	DSC-7Lab: JAVA Script, HTML, CSS Lab		4		
	DSC-8Lab: C# Programming Lab		4		
7	DSC-9: Computer Graphics and Visualization	3		DSE-1: Any one from Discipline Specific Elective Courses, Group – 1[**]	
	DSC-10: Design and Analysis of Algorithms	3			3
	DSC-11: Software Engineering	3		DSE-2: Any one from Discipline Specific Elective Courses, Group – 2[**]	
	DSC-9Lab: Computer Graphics and Visualization Lab		4		
	DSC-10Lab: Algorithms Lab		4		3
				Research Methodology:	3
8	DSC-12: Artificial Intelligence and Applications	3		DSE-3: Any one from Discipline Specific Elective Courses, Group – 3[**]	
	DSC-13: Computer Organization and Architecture	3			
	DSC-14: Data Warehousing and Data Mining	3			3
	DSC-12Lab: AI Lab		4	Research Project:	6

3. Computer Science as MINOR with another Subject as MAJOR (As per Table IIA of Model Curriculum)

Semester	Discipline Specific Core Courses (DSC)	Theory	Lab
1	DSC-1: Computer Fundamentals and Programming in C	4	
	DSC-1Lab: C Programming Lab		4
2	DSC-2: Data Structures using C	4	
	DSC-2Lab: Data structures Lab		4
3	DSC-3: Object Oriented Programming Concepts and Programming in JAVA	4	
	DSC-3Lab: JAVA Lab		4
4	DSC-4: Database Management Systems	4	
	DSC-4Lab: DBMS Lab		4
5	DSC-5: Programming in PYTHON	3	
	DSC-5Lab: PYTHON Programming lab		4
6	DSC-6: Internet Technologies	3	
	DSC-6Lab: JAVA Script, HTML, CSS Lab		4

Note: "Hour of Teaching/Week" spans the Theory and Lab columns.

* Vocational Courses:

Group-1:
- DTP, CAD and Multimedia
- Hardware and Server Maintenance
- Web Content Management Systems
- E-Commerce
- Web Designing

Group-1:
- Health Care Technologies
- Digital Marketing
- Office Automation
- Multimedia Processing
- Accounting Package

** Discipline Specific Elective Courses:

Group-1:
- IoT
- Cyber Law and Cyber Security
- Web Programming - PHP and MySQL
- Clouds, Grids, and Clusters
- Software Testing

Group-2:
- Information and Network Security
- Data Compression
- Discrete Structures
- Opensource Programming
- Multimedia Computing
- Big Data

Group-3:
- Data Analytics
- Storage Area Networks
- Pattern Recognition
- Digital Image Processing
- Parallel Programming
- Digital Signal Processing

Model Syllabus for BSc (Basic and Honors), Semesters I and II

Semester: I

Course Code: DSC-1	**Course Title: Computer Fundamentals and Programming in C**
Course Credits: 04	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Confidently operate Desktop Computers to carry out computational tasks
- Understand working of Hardware and Software and the importance of operating systems
- Understand programming languages, number systems, peripheral devices, networking, multimedia and internet concepts
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given problem
- Perform input and output operations using programs in C
- Write programs that perform operations on arrays

Course Content

Content	Hours
Unit - 1	
Fundamentals of Computers: Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organisation of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples.	8
Unit - 2	
Introduction to C Programming: Over View of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. **C Programming Basic Concepts:** C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants. **Input and output with C:** Formatted I/O functions - *printf* and *scanf,* control stings and escape sequences, output specifications with *printf* functions; Unformatted I/O functions to read and display single character and a string - *getchar, putchar, gets* and *puts* functions.	10
Unit - 3	
C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion.	12

Control Structures: Decision making Statements - S*imple if, if_else*, *nested if_else, else_if ladder, Switch-case*, *goto, break* & *continue* statements; Looping Statements - Entry controlled and Exit controlled statements, *while, do-while, for* loops, Nested loops.	
Unit - 4	
Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. Strings: Declaring & Initializing string variables; String handling functions - *strlen, strcmp, strcpy and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric* etc. **Pointers in C:** Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers;	12
Unit - 5	
User Defined Functions: Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type. **User defined data types:** Structures - Structure Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, comparing structure variables, Array of Structures; Unions - Union definition; difference between Structures and Unions.	10

Text Books
1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. E. Balgurusamy: Programming in ANSI C (TMH)

References
1. Kamthane: Programming with ANSI and TURBO C (Pearson Education)
2. V. Rajaraman: Programming in C (PHI – EEE)
3. S. ByronGottfried: Programming with C (TMH)
4. Kernighan & Ritche: The C Programming Language (PHI)
5. Yashwant Kanitkar: Let us C
6. P.B. Kottur: Programming in C (Sapna Book House)

Course Code: DSC-1Lab	Course Title: C Programming Lab
Course Credits: 02	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 04

Practice Lab

The following activities be carried out/ discussed in the lab during the initial period of the semester.

1. Basic Computer Proficiency
   a. Familiarization of Computer Hardware Parts
   b. Basic Computer Operations and Maintenance.
   c. Do's and Don'ts, Safety Guidelines in Computer Lab
2. Familiarization of Basic Software – Operating System, Word Processors, Internet Browsers, Integrated Development Environment (IDE) with Examples.
3. Type Program Code, Debug and Compile basic programs covering C Programming fundamentals discussed during theory classes.

Programming Lab

Part A:

1. Write a C Program to read radius of a circle and to find area and circumference
2. Write a C Program to read three numbers and find the biggest of three
3. Write a C Program to demonstrate library functions in *math.h*
4. Write a C Program to check for prime
5. Write a C Program to generate n primes
6. Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
7. Write a C Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
8. Write a C Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
9. Write a C Program to find the roots of quadratic equation (demonstration of switch-case statement)
10. Write a C program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
11. Write a C Program to remove Duplicate Element in a single dimensional Array
12. Program to perform addition and subtraction of Matrices

Part B:

1. Write a C Program to find the length of a string without using built in function
2. Write a C Program to demonstrate string functions.
3. Write a C Program to demonstrate pointers in C
4. Write a C Program to check a number for prime by defining *isprime( )* function
5. Write a C Program to read, display and to find the trace of a square matrix
6. Write a C Program to read, display and add two m x n matrices using functions
7. Write a C Program to read, display and multiply two m x n matrices using functions
8. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
9. Write a C Program to Reverse a String using Pointer
10. Write a C Program to Swap Two Numbers using Pointers
11. Write a C Program to demonstrate student structure to read & display records of n students.
12. Write a C Program to demonstrate the difference between structure & union.

Note: Student has to execute a minimum of 10 programs in each part to complete the Lab course

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part B	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Viva Voice based on C Programming		05
Practical Record		05
Total		**40**

Semester: II

Course Code: DSC-2	**Course Title: Data Structures using C**
Course Credits: 04	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 30
Exam Marks: 70	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
- Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
- Demonstrate different methods for traversing trees
- Compare alternative implementations of data structures with respect to performance
- Describe the concept of recursion, give examples of its use
- Discuss the computational efficiency of the principal algorithms for sorting and searching

Course Content

Content	Hours
Unit - 1	
Introduction to data structures: Definition; Types of data structures - Primitive & Non-primitive, Linear and Non-linear; Operations on data structures. Algorithm Specification, Performance Analysis, Performance Measurement Recursion: Definition; Types of recursions; Recursion Technique Examples - Fibonacci numbers, GCD, Binomial coefficient ^nC_r, Towers of Hanoi; Comparison between iterative and recursive functions.	10
Unit - 2	
Arrays: Basic Concepts – Definition, Declaration, Initialisation, Operations on arrays; Types of arrays; Arrays as abstract data types (ADT); Representation of Linear Arrays in memory; Traversing linear arrays; Inserting and deleting elements; Sorting – Selection sort, Bubble sort, Quick sort, Selection sort, Insertion sort; Searching - Sequential Search, Binary search; Iterative and Recursive searching; Multidimensional arrays; Representation of multidimensional arrays; Sparse matrices.	10
Unit - 3	
Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and de-allocation functions - *malloc*, *calloc*, *realloc* and *free.* Linked list: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly liked list, Header liked list, Circular linked list; Representation of Linked list in Memory; Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion; Memory allocation; Garbage collection,	12

Unit - 4	
Stacks: Basic Concepts – Definition and Representation of stacks; Operations on stacks; Applications of stacks; Infix, postfix and prefix notations; Conversion from infix to postfix using stack; Evaluation of postfix expression using stack; Application of stack in function calls. Queues: Basic Concepts – Definition and Representation of queues; Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues;	10

Unit - 5	
Trees: Definition; Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth; Binary tree: Type of binary trees - strict binary tree, complete binary tree, binary search tree and heap tree; Array representation of binary tree. Traversal of binary tree; *preorder, inorder* and *postorder* traversal; Reconstruction of a binary tree when any two of the traversals are given.	10

Text Books

1. Satraj Sahani: Fundamentals of Data Structures

References

1. Tanenbaum: Data structures using C (Pearson Education)
2. Kamathane: Introduction to Data structures (Pearson Education)
3. Y. Kanitkar: Data Structures Using C (BPB)
4. Kottur: Data Structure Using C
5. Padma Reddy: Data Structure Using C
6. Sudipa Mukherjee: Data Structures using C – 1000 Problems and Solutions (McGraw Hill Education, 2007))

Course Code: DSC-2Lab	Course Title: Data Structures Lab
Course Credits: 02	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 04

Programming Lab

Part A:

1. Write a C Program to find GCD using recursive function
2. Write a C Program to display Pascal Triangle using binomial function
3. Write a C Program to generate n Fibonacci numbers using recursive function.
4. Write a C Program to implement Towers of Hanoi.
5. Write a C Program to implement dynamic array, find smallest and largest element of the array.
6. Write a C Program to create two files to store even and odd numbers.
7. Write a C Program to create a file to store student records.
8. Write a C Program to read the names of cities and arrange them alphabetically.
9. Write a C Program to sort the given list using selection sort technique.
10. Write a C Program to sort the given list using bubble sort technique.

Part B:

1. Write a C Program to sort the given list using insertion sort technique.
2. Write a C Program to sort the given list using quick sort technique.
3. Write a C Program to sort the given list using merge sort technique.
4. Write a C Program to search an element using linear search technique.
5. Write a C Program to search an element using recursive binary search technique.
6. Write a C Program to implement Stack.
7. Write a C Program to convert an infix expression to postfix.
8. Write a C Program to implement simple queue.
9. Write a C Program to implement linear linked list.
10. Write a C Program to display traversal of a tree.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Viva Voice based on C Programming		05
Practical Record		05
Total		**40**

<mark>Open Electives in Computer Science:</mark>

(For BA, BSc, BCom, BSW, BBA, BBM students studying Core Courses other than Computer Science/ Computer Applications)

- Office Automation
- C Programming Concepts
- Multimedia Processing
- Python Programming Concepts
- R Programming
- E-Content Development
- E-Commerce
- Web Designing
- Computer Animation
- Accounting Package

ಬೆಂಗಳೂರು ಉತ್ತರ ವಿಶ್ವವಿದ್ಯಾಲಯ

ಟಮಕ, ಕೋಲಾರ – 563103

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: GENETICS

2021-22 onwards

BANGALORE UNIVERSITY

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_____

No- / BOS /UG/FS/NEP- syllabus/ Zoology & Genetics/2021/1   20.10.2021

The Registrar
Bengaluru North University,
Tamaka, Behind SP Office, Kolar- 563103

Sir,

Sub: Submission of syllabus of B. Sc Zoology and Genetics (UG)prepared in accordance
       withNEP-2020 reg.
Ref: 1. Email from HEC, GOK dated 15.09.2021.
      1. Your office letter of Appointment as Chairman BOS dated 19.10.2021.

        This has reference to aforesaid subject and as per the given instructions, I am herewith submitting the syllabus for BSc (UG) in Zoology and Genetics prepared in accordance with NEP-2020 for further action. I request you to accept the same and do the needful. Further I request you to issue orders to get expenses incurred along with remuneration to members for having worked in drafting the syllabus.

                Thanking You,

                        Yours Truly,

                         Sd/-

                        (P MAHABOOB BASHA)

Encl: 1. Syllabus in BSc Zoology & Genetics (UG)

B.Sc., GENETICS SYLLABUS
(I to II Semesters)

Framed According to the National Educational Policy (NEP 2020)

[To implement from the academic year 2021-22]

BENGALURU NORTH UNIVERSITY
Proceedings of the meeting of BOS (UG) in Genetics

Reference:
1. G.O. ED: 260/USE/2019(part-1), Bangalore dated 15.09.2021
2. Email from HEC, GOK dated 15.09.2021
3. U. O- Letter of Appointment as Chairman of BOS dated 18.10.2021

Adverting to above, the drafted syllabus prepared by Higher Educational Council (HEC), Government of Karnataka (GOK) pertaining to B. Sc Genetics prepared by Bangalore University, Bangalore-560 056 was circulated by online mode (mailed on 19.10.2021) to all the members of BOS, for scrutiny and approval by 20.10.2021 by 8.00 pm.

Agenda: Approval of syllabus for BSc in Genetics theory and Practical and Scheme of examination for I and II semesters of Bengaluru North University, Bengaluru.

Resolution: The proposed syllabus for BSc in Genetics theory and Practical and Scheme of examination for I and II semesters were scrutinized thoroughly, finalized with appropriate inclusion(s) and deletion(s) of content(s) and finally approved.

Members Participated

1. Dr. P. Mahaboob Basha, Professor, Dept of Zoology, Bangalore University, Bangalore.   Chairman
2. Dr. Shakuntala, Asso. Professor of Zoology, University of Mysore, Mysore.   Member (E)
3. Dr. Shabana Begum, Asso. Professor of Zoology, Maharani Cluster University, Bangalore.   Member(E)
4. Ms. Pavana Kamath Asso. Professor in Genetics, Oxford College, Bangalore.   Member(E)
5. Dr. Jude CrustuJay. Associate Professor in Genetics, Christujayanti College, Bangalore.   .   Member
6. Dr. D G. Gangadhar Rao. Associate Professor in Zoology and Principal, GFGC for Women, Kolar.   Member
7. Dr. V. Kurunji, Asst. Professor in Genetics, St. George College, Bangalore.   Member
8. Dr. Gayatri, Asst. Professor in Zoology, BGS Science Academy, Agalagurki, Chickballapur.   Member
9. Ms. G. Lavanya. Asst. Professor in Genetics, Sri Bhagavan Mahavir Jain College, KGF   Member
10. Ms. Priya John. Asst. Professor in Zoology, Bangalore City College, Bangalore.   Member

The chairman thanked all members for their cooperation. The members have sent their consent (approval) through their ID mails the same is recorded and exact of the proceedings prepared for dispatch to academic bodies of University for approval and implementation.

Date: 20.10.2021

(MAHABOOB BASHA)
CHAIRMAN BOS (UG), BNU
B. Sc in Genetics

Introduction

      The curriculum framework for B.Sc. degree in Genetics is structured to offer a broad outline that helps in understanding genetic factors and disorders about promoting health and preventing disease. The course is upgraded keeping in mind the aspirations of students, changing nature of the subject as well as the learning environment. The core concepts within subject have been updated to incorporate the recent advancements, techniques to upgrade the skills of learners. The syllabus under NEP-2020 is expected to enhance the level of understanding among students and maintain the high standards of graduate program offered in the country. Effort has been made to integrate the use of recent technology and MOOCs to assist teaching-learning process among students. The major objective of the graduate program is to elevate the subject knowledge among students, and making them as critical thinkers thereby students can address the issues related to genetics logically and efficiently and helps in securing a career in academia, industry, pharmaceutical research and development in private as well as public sectors. In a nutshell, the course serves as plethora of opportunities in different fields right from classical to clinical genetics.

AIMS AND OBJECTIVES OF UG PROGRAM IN GENETICS

- The Programme offers both classical as well as modern concepts of Genetics in higher education.

- It enables the students to study genetic diversity in both local and global environments.

- To update the concepts concerning genetic diversity among different traits of population, pattern of inheritance.

- To correlate contemporary and modern techniques like genomics, metagenomics, genome editing and molecular diagnostic tools.

- Bioinformatics and computational tools used in modern sciences will provide ample opportunities to explore different career avenues and provide opportunity to be an entrepreneur.

GRADUATE ATTRIBUTES IN B.Sc. (Hons.) GENETICS

Some of the characteristic attributes a graduate in Genetics should possess are:

- **Disciplinary knowledge and skills**

- **Skilled communication**

- **Critical thinker and problem solving capacity**

- **Logical thinking and reasoning**

- **Team spirit**

- **Leadership quality**

- **Digitally efficacy**

- **Ethical awareness/reasoning**

- **Lifelong learning**

Flexibility

- The programmes are flexible enough to allow liberty to students in designing them according to their requirements. Students may choose a single Major, one Major with a Minor, and one Major with two Minors. Teacher Education or Vocational courses may be chosen in place of Minor/s. Below listed are the various options students may choose from.

- One Major subject/discipline, Two Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities.

- One Major and one Minor subject/discipline along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities

- Two Major subject/disciplines along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses, including Extracurricular Activities (subject to fulfilling the requirements as stated in 3. i and 3.ii).

- One Major subject/discipline and one Vocational course along with Languages, Generic Electives, Ability Enhancement and Skill Development and courses including Extracurricular Activities.

- One Major Discipline and One Education Discipline along with Languages, Generic Electives, Ability Enhancement and Skill Development Courses including Extracurricular Activities.

- ## Weightage for assessments

-

Type of Course	Formative Assessment / IA Marks	Summative Assessment Marks
Theory	**40**	**60**
Practical	**25**	**25**
Projects*	**45**	**105**
Experiential Learning (Internships etc.)		

*In lieu of the research Project, two additional elective papers/ Internship may be offered.

4

IIA. Model Program Structures for the Under-Graduate Programs in Universities and Colleges in Karnataka

Example: Bachelor of Science (Basic/ Hons.) (with Genetics & Botany as subjects with practicals) with one major and one minor

Sem.	Discipline Core (DSC) (Credits) (L+T+P)	Discipline Elective(DSE) / Open Elective (OE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC), Languages (Credits) (L+T+P)		Skill Enhancement Courses (SEC)		Total Credits
					Skill based (Credits) (L+T+P)	Value based (Credits) (L+T+P)	
I	Genetics A1(4+2) Botany B1(4+2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs. each)		SEC-1: Digital Fluency (2) (1+0+2)	Physical Education for Health &Wellness fitness(1)(0+0+2)　　　(1) (0+0+2)	25
II	Genetics A2(4+2) BotanyB2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)	Environmental Studies (2)		Physical Education - 　　　　　　　　　　NCC/NSS/R	25
Exit option with Certificate (50 credits)							
III	Genetics A3(4+2) Botany B3(4+2)	OE-3 (3)	L1-3(3), L2-3(3) (4 hrs. each)		SEC-2: Artificial Intelligence (2)(1+0+2)	Physical Education- 　　　　　　　　　　NCC/NSS/R	25
IV	Genetics A4(4+2) Botany B4(4+2)	OE-4 (3)	L1-4(3), L2-4(3) (4 hrs. each)	Constitution of India (2)		Physical Education - 　　　　　　　　　　NCC/NSS/R	25
Exit option with Diploma in Science (100 credits) OR Choose any one of the core subjects as Major and the other as Minor							
V	Genetics A5(3+2) Genetics A6(3+2) Botany B5(3+2)	Vocational-1 (3)			SEC-3: SEC such as Cyber Security (2) (1+0+2)		20
VI	Genetics A7(3+2) Genetics A8(3+2) Botany B6(3+2)	Vocational-2 (3) Internship (2)			SEC-4: Professional Communication (2)		22
Exit option with Bachelor of Science Degree, B. Sc. Degree in Zoology (142 credits) or continue studies with the Major in the third year							
VII	Genetics A9(3+2) GeneticsA10(3+2) Genetics A11(3)	Genetics E-1 (3) Genetics E-2 (3) Res. Methodology (3)					22
VIII	Genetics A12(3+2) Genetics A13(3) Genetics A14(3)	Zoology E-3 (3) Research Project (6)*					20
Award of Bachelor of Science Honours Degree, B.Sc.(Hons.) Degree in Genetics (184 credits) **In lieu of the research Project, two additional elective papers/ Internship may be offered.**							

2. Course Structure

5.1 Credit distribution for the course

Semester	Course Opted	Course Name	Credits
I	Major Core Course-1 (Theory)	Cell Biology and Genetics	4
	Major Core Course-1 (Practical)	Cell Biology and Genetics	2
	Minor Discipline Course -1 (Theory)	Nutritional Genetics	4
	Minor Discipline Course -1 (practical)	Nutritional Genetics	2
	Open Elective Course -1(Theory)	Principles of Genetics	3
	Skill Enhancement (Vocational) Elective Course -1 (Practical)	Genetic Counselling	2
II	Major Core Course-2 (Theory)	Bio Instrumentation and Animal Cell Culture	4
	Major Core Course-2 (Practical)	Bio Instrumentation and Animal Cell Culture Cell	2
	Minor Discipline Course -2 (Theory)	Medical Genetics	4
	Minor Discipline Course -2(Practical)	Medical Genetics	2
	Open Elective Course -2(Theory)	Genetic Counselling	3
Exit option with certificate in Genetics (50 credits)*			
III	Major Core Course-3 (Theory)	Biomolecules and Molecular Genetics	4
	Major Core Course-3 (Practical)	Biomolecules and Molecular Genetics	2
	Minor Discipline Course -3 (Theory)	Pharmaco-genetics	4
	Minor Discipline Course -3(Practical)	Pharmaco-genetics	2
	Open Elective Course -3(Theory)	Eugenics, Euthenics and Society	3
	Skill Enhancement (Vocational) Elective Course -3 (Practical)	Genetic diagnostics and Public Health	2
IV	Major Core Course- 4 (Theory)	Human Genetics and Genetic Counselling	4
	Major Core Course-4 (Practical)	Human Genetics and Genetic Counselling	2
	Minor Discipline Course –4(Theory)	Medical and Environmental impact on development	4
	Minor Discipline Course –4(Practical)	Medical and Environmental impact on development	2
	Open Elective Course -4 (Theory)	Human Genetic Disorders	3
Exit option with Diploma in Genetics (100 credits)*			
V	Major Core Course-5 (Theory)	Gene Regulation and DNA Repair	3
	Major Core Course-5 (Practical)	Gene Regulation and DNA Repair	2
	Major Core Course-6 (Theory)	Plant cell and Tissue culture Technology	3
	Major Core Course-6 (Practical)	Plant cell and Tissue culture Technology	2
	Minor Discipline Course -5 Theory)	Radiation Genetics	3
	Minor Discipline Course - 5(Practical)	Radiation Genetics	2
	Discipline Specific Elective Course – 5 (Theory)	Clinical Genetics	3
	Vocational Elective Course -1(Practical)	Geno-toxicology	2

VI	Major Core Course- 7 (Theory)	Genes and Development	3
	Major Core Course - 7 (Practical)	Genes and Development	2
	Major Core Course- 8 (Theory)	Population and Evolutionary Genetics	3
	Major Core Course – 8 (Practical)	Population and Evolutionary Genetics	2
	Minor Discipline Course -6 (Theory)	Scientific Communication	3
	Minor Discipline Course -6 (Practical)	Scientific Communication	2
	Discipline Specific Elective Course – 6 (Theory)	Statistical Genetics	3
	Vocational Elective Course -2 (Practical)	Seed Science and Technology	3
	Internship	Research Centers/Industries/Hospitals	2
Exit option with B.Sc. in Genetics (142credits)*			
VII	Major Core Course- 9 (Theory)	Immunology and Immunogenetics	3
	Major Core Course- 9 (Practical)	Immunology and Immunogenetics	2
	Major Core Course- 10 (Theory)	Cancer and Radiation Genetics	3
	Major Core Course- 10 (Practical)	Cancer and Radiation Genetics	2
	Major Core Course- 11 (Theory)	Microbial Genetics and Technology	3
	Major Core Course- 11 (Practical)	Microbial Genetics and Technology	2
	Discipline Specific Elective Course – 7 (Theory)	Animal Biotechnology	3
	Discipline Specific Elective Course – 7 (Theory)	Forensic Genetics	3
	Open Elective	Research Methodology	3
VIII	Major Core Course- 12 (Theory)	Neurogenetics and Neurological disorders	3
	Major Core Course- 12 (Practical)	Neurogenetics and Neurological	2
	Major Core Course- 13 (Theory)	Behavioural Genetics	3
	Major Core Course- 13 (Practical)	Behavioral Genetics	2
	Major Core Course- 14 (Theory)	Plant Breeding	3
	Major Core Course- 14 (Practical)	Plant Breeding	2
	Discipline Specific Elective Course – 8 (Theory)	Plant Biotechnology	3
	Research Project	Based on student interest and teacher expertise	6
Exit option with B.Sc. (Hons) in Genetics (184 credits)*			
IX	Major Core Course- 15 (Theory)	Genetic Engineering and Stem Cell technology	4
	Major Core Course- 15 (Practical)	Genetic Engineering and Stem Cell technology	2
	Major Core Course- 16 (Theory)	Computational Genetics	4
	Major Core Course- 16 (Practical)	Computational Genetics	2
	Discipline Specific Elective Course – 9 (Theory)	Genomics and Proteomics	3
	Skill Enhancement (Vocational) Elective Course -9	Assisted Reproductive techniques	2
X	Major Core Course- 17 (Theory)	Advanced cellular and Molecular Genetics	4
	Major Core Course- 17 (Practical)	Advanced cellular and Molecular Genetics	2

Major Core Course- 18 (Theory)	Animal/ Experimental Genetic System and Pharmacodynamics	4
Major Core Course- 18 (Practical)	Animal/ Experimental Genetic System and Pharmacodynamics	2
Major Core Course- 19 (Theory)	Environmental Genetics	2
Major Core Course- 19 (Practical)	Environmental Genetics	
Discipline Specific Elective Course – 10 (Theory)	Genetic Engineering	3
Skill Enhancement (Vocational) Elective Course -9	Assisted Reproductive techniques	2
Exit option with M.Sc. in Genetics (268 credits)*		

3. CURRICULUM STRUCTURE

CURRICULUM STRUCTURE FOR UNDER GRADUATE DEGREE PROGRAM IN GENETICS

Name of the Degree: B.Sc. (Hons) Specialization: Genetics (I & II sem) Program Articulation Matrix:

This matrix lists only the core courses. Core courses list the courses that are essential for every student to earn his degree. It includes all types of courses (theory, lab, tutorial, Project, Internships, … that every student of the course).

Sem.	Name of the course (with code)	What all program outcomes the course addresses (not exceeding three per course)	Prerequisite courses	Concurrent course (with code)#	Pedagogy##	Assessment $
I	Cell Biology And Genetics (DSCC5GE NT1)	1. Understand the structure and function of all the cell organelles. 2. Know about the chromatin structure and its location. 3. Understand the Mendel's laws and the its deviations.	Life science studied as of the options in 12th standard	Cell Biology and Genetics (DSCC5GE NP1)	House Examination/Test/ Seminars/ Assignment/ Minor project/ Active learning/ Problem based/Review Writing/ Paper presentation/ Case studies	Formative /summative assessment, Evaluation/ Result analysis/ Application of Heutagogy,
I	Nutritional Genetics (MDC5GE NT1)	1. Understand relationship between food, microbiome, genome and epigenome. 2. Know how a plateful of meal can control metabolism, prevent diseases and improve health. 3. Learn importance of nutrition and effects of adulterants.	Life science studied as of the options in 12th standard	Nutritional Genetics (MDC5GENP1)	House Examination/Test/ Seminars/ Assignment/ Minor project/ Active learning/Problem based/Review Writing/ Paper presentation/ Case studies	Formative/summative assessment, Evaluation/ Result analysis/ Application of Heutagogy,

I	Principles of Genetics (OEC5GENT1)	1. Study historical overview and laws Inheritance. 2. Understand Mendel"s principles and deviations. 3. Gene interactions and their outcome through gene mapping.	Life science studied as of the options in 12th standard		House Examination/Test/ Seminars/ Assignment/ Minor project/ Active learning/ Problem based/ Review Writing/ Paper presentation/ Case studies	Formative /summative assessment, Evaluation/ Result analysis/ Application of Heutagogy,
I	Genetic Counseling (VEC5GENP1)	1. Learning methods of genetic testing 2. understanding pedigree construction, analysis and risk calculation 3. intensive practical knowledge of Genetic Counseling.	Life science studied as of the options in 12th standard		House Examination/Test/ Seminars/Assignment/ Minor project/ Active learning/ Problem based/Review Writing/ Paper presentation/ Case studies	Formative /summative assessment, Evaluation/ Result analysis/ Application of Heutagogy
II	Bio-instrumentation & Animal cell Culture (DSCC5GENT2)	1. Understand the basic principles of different laboratory equipments. 2. Know the uses of the analytical equipments in various biological applications. Understand the cell lines and culture media and cell culture methods	Life science Studied as of the options in 12th standard	Bio-instrumentation & Animal Cell Culture (DSCC5GENP2)	House Examination/Test/ Seminars/Assignment/ Minor project/ Active learning/Problem based/Review Writing/ Paper presentation/ Case studies	Formative /summative assessment, Evaluation/ Result analysis/ Application of Heutagogy
II	Medical Genetics (MDC5GEN T2)	1. Understand genetic basis of human diseases and disease gene identification 2. Have insight of techniques used in medical genetics 3. Have thorough knowledge of gene therapy and its strategies	Life science studied as of the options in 12thstandard	Medical Genetics (MDC5GENP2)	House Examination/Test/ Seminars/Assignment/ Minor project/ Active learning/Problem based/Review Writing/ Paper presentation/ Case studies	Formative /summative assessment, Evaluation/ Result analysis/ Application of Heutagogy
II	Genetic Counselling (OEC5GEN T2)	1. Genetic counselling methods 2. Reproductive risk calculation 3. Ethical and legal issues of genetic counselling	Life science studied as of the options in 12th standard		House Examination/Test/ Seminars/Assignment/ Minor project/ Active learning/Problem based/Review Writing/ Paper presentation/ Case studies	Formative /summative assessment, Evaluation/ Result analysis/ Application of Heutagogy

I SEMESTER B.SC., GENETICS (HONS) THEORY SYLLABUS
DISCIPLINE SPECIFIC CORE COURSE DSCC
THEORY PAPER: DSCC5GENT1: CELL BIOLOGY AND GENETICS

Course Title: Cell Biology and Genetics Code DSCC5GENT1	Course Credits:04
Total Contact Hours: 56	Duration of DSC: 4Hours
Formative Assessment Marks: 40	Summative Assessment Marks:60

Course Outcomes:

By the end of the course the students will be able to

1. Understand the structure and function of all the cell organelles.
2. Know about the chromatin structure and its location.
3. Understand the Mendel's laws and its deviations.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)		1	2	3	4	5	6	7	8	9	10	11	12
I.	Core competency	x											
II.	Critical thinking	x											
III.	Analytical reasoning	x											
IV.	Research skills	x											
V.	Team work	x											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X" in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

	Content	Hours 56
Chapter	Unit - 1	14
01	Ultrastructure, chemical composition and functions of Plasma membrane. Ultrastructure and functions of Cytoplasmic organelles: Mitochondria, Kreb's cycle, BIS oxidative phosphorylation, Endoplasmic reticulum, Ribosomes, Lysosomes, Golgi bodies and Cytoskeleton.	
02	Nucleus: Morphology, nuclear envelope, nucleoplasm, nucleolus and chromatin.	

03	Ultra structure of Eukaryotic Chromosome: Macro-molecular organization- Nucleosome model. Primary and Secondary constriction, SAT-bodies, Special chromosomes- structure and function of Polytene and Lampbrush chromosome	
Chapter	Unit – 2	14
04	Molecular Basis Cell Cycle and Cell Division: G1, S, G2 and M phase, Checkpoints. Mitosis: Stages, Mitotic apparatus, cytokinesis, Mitogens and Inhibitors, Significance. Meiosis: Stages, Synaptonemal complex, crossing over and chiasma formation, Significance.	
05	Cell senescence and Cell death: cellular features of Senescence- spontaneous and induced, Programmed cell death, Mechanism of cell death and significance.	
06	Cancer Biology: Introduction to cancer, Benign and malignant, Sarcoma, Carcinoma, Lymphoma and leukemia, Properties of malignant cells.	
Chapter	Unit – 3	14
07	Biography of Mendel and his experiments: Law of Segregation: Monohybrid cross, back cross and Test cross, Genetic Problems related. Law of Independent Assortment: Dihybrid cross, Back cross and Test cross, Genetic Problems related.	
8	Multiple Alleles: Definition, ABO blood groups and Rh factor in Human, Genetic Problems related.	
9	Gene Interactions: Deviations from Mendelism: Incomplete inheritance and co-dominance, Complementary gene interaction (9:7), Supplementary gene interaction(9:3:4), Recessive Epistasis, Non-Epistasis (with an example for each trait)	
Chapter	Unit – 4	14
10	Linkage: Linkage definition, cis and trans arrangement of genes, Linkage group in *Drosophila* and man. Types of linkage – complete and incomplete linkage maps. Linkage map – E.g. *Drosophila,* construction of linkage maps. Crossing over - Types, mechanism of crossing over, interference and coincidence, Factors affecting linkage and crossing over, significance of linkage and crossing over.	
11	Human Cytogenetics: Normal Human karyotype (Male & Female)	
12	Clinical features and Karyotype of Syndromes: Cri-du-chats, Down's, Edward's, Patau's, Turner's, and Klinefelter's.	

Text Books:

1. Karp, G. (2009). *Cell and molecular biology: concepts and experiments*. John Wiley & Sons.
2. Russell, P. J., Hertz, P. E., McMillan, B., & Benington, J. (2020). *Biology: the dynamic science*. Cengage Learning.

3. Singh, S. P., & Tomar, B. S. (2008). *Cell biology*. Rastogi Publications, Meerut, India.
4. Cooper, G. M., Hausman, R. E., & Hausman, R. E. (2007). *The cell: a molecular approach* (Vol. 4). Washington, DC: ASM press.
5. Gupta, P.K. (2010). Cytogenetics. Rastogi Publications, Meerut, India.
6. Lewin, B., Krebs, J., Kilpatrick, S. T., & Goldstein, E. S. (2011). *Lewin's genes X*. Jones & Bartlett Learning.

References:

1. Pierce, B. A. (2012). *Genetics: a conceptual approach*. Macmillan publication.
2. Roberts, K., Alberts, B., Johnson, A., Walter, P., & Hunt, T. (2002). Molecular biology of the cell. *New York: Garland Science*.
3. Lodish, Harvey, et al. *Molecular cell biology*. Macmillan, 2008.
4. Snustad, D. P., & Simmons, M. J. (2015). *Principles of genetics*. John Wiley & Sons.

Pedagogy:

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	20
Seminars/Assignment/ Minor project	15
Participation in class/ Attendance	05
Total	**40**

I SEMESTER B.SC., GENETICS (HONS) PRACTICAL SYLLABUS
DISCIPLINE SPECIFIC CORE COURSE– DSCC
PRACTICAL PAPER: CELL BIOLOGY AND GENETICS/DSCC5GENP1

Course Title/Code: Cell Biology and Genetics / DSCC5GENP1	Course Credits:02
Total Contact Hours: 56	Duration of MD: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks:25

By the end of the course the students will be able to

1. Learn techniques in cytogenetics
2. Solve problems on mendelian genetics and its deviation
3. Prepare and analyse the karyotype of normal and syndromic individuals.

Course content

Paper Code	Practical	Credits:2 Hours 56
MDS GENP 1	1. Preparation of pre-treating / fixing agents/ stains for cytological studies. 2. Study of Mitosis using root tips 3. Study of Meiosis using flower buds/ grasshopper testes 4. Preparation of salivary gland chromosomes in *Chironomous* larvae 5. Preparation of salivary gland chromosomes in *Drosophila* larvae 6. Blood typing in humans for multiple alleles and Rh factor 7. Histological study of Cancer types using permanent slides 8. Genetic Problems on Monohybrid cross, 9. Genetic Problems on Dihybrid cross 10. Genetic Problems Non-Mendelian Interactions. 11. Problems on Linkage and crossing over. 12. Interference and coincidence. 13. Problems based on construction of genetic map.	

Pedagogy:

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	10
Seminars/Assignment/Minor Project	10
Attendence	05
Total	**25**

I SEMESTER B. Sc. GENETICS (HONS) THEORY SYLLABUS
OPEN ELECTIVE OEC
THEORY PAPER: OEC5GENT1: PRINCIPLES OF GENETICS

Course Title: Principles of Genetics Code: OEC5GENT1	Course Credits:03
Total Contact Hours: 42	Duration of OEC: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks:60

Course Outcomes (COs):

Upon successful completion, each student will have the basic knowledge:

1. Historical overview and laws Inheritance.

2. Understand Mendel‟s principles and deviations.

3. Gene interactions and their outcome through gene mapping.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12
VI. Core competency	x											
VII. Critical thinking	x											
VIII. Analytical reasoning	x											
IX. Research skills	x											
X. Team work	x											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark „X‟ in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

		Content	Hours 42
Chapter		Unit – 1	14
01		**History of Genetics:** Pre- Mendelian genetic concepts; Concepts of Phenotype and Genotype; Heredity, variation, Pure lines and Inbred Lines Biography of Mendel; Mendelian experiments on pea plants - Law of Segregation; Monohybrid cross, Back cross and Test cross, genetic problems related. Law of Independent Assortment: Dihybrid cross in pea plant, Back cross and Test cross, genetic problems related.	

02	**Multiple Alleles:** Definition, ABO blood groups and Rh factor in Human, Genetic Problems related. Deviations from Mendelism - Incomplete inheritance and Codominance; Inter allelic- Complementary gene interaction (9:7) Ex: *Lathyrus odoratus*; Supplementary gene interaction (9:3:4) Ex: Grain color in Maize; Epistasis - Dominant Ex.: Fruit color in *Cucurbita pepo*, Recessive Inheritance-Ex.: Coat color in Mice. Non- Epistasis - Ex.: Comb pattern in Poultry.		
03	**Gene mapping:** Linkage - Definition, Linkage group- *Drosophila and man*; Types of linkage-complete linkage and incomplete linkage, Significance of linkage. **Linkage maps:** Crossing over - definition; recombination and recombination frequency, Mechanism of crossing over: Chiasma Interference and coincidence; Coupling and Repulsion hypothesis.		
Chapter	Unit – 2		14
04	**Sex Determination:** Chromosome theory of Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in *Drosophila*, Y chromosome in sex determination of *Melandrium*.		
05	**Genetic and Hormonal control of Sex determination:** Genic balance theory of Bridges, Gynandromorphs, Environment and sex determination.		
06	Sex chromosomes and Dosage compensation:		
Chapter	Unit – 3		14
07	**Extra Chromosomal Inheritance:** Characteristic features of Cytoplasmic Inheritance; Inheritance of- Mitochondrial DNA, Chloroplast DNA, Kappa particles in *Paramecium*, Sigma factor in *Drosophila*, Shell coiling in snail.		
08	**Behavioral Genetics:** Introduction to Genetics and Behaviour, Mating behavior in Drosophila, Hygienic behavior in Honeybee, Nesting behavior in Ants, Territoriality and conflict behavior in Primates.		
09	**Microbial Genetics:** Transformation, Conjugation, Lytic cycle, Lysogeny, Transduction, Gene mapping by Conjugation and Transduction.		

Text Books:

1. Concepts of Genetics. Klug, WS., Cummins, MR., Spencer, C., Palladino, MA. 2020. 10th Edition. Pearsons Publication.
2. Genetics: A Conceptual approach.Benjamin A.Pierce. 2000. 7th edition. McMillan Publication.
3. Genetics From Genes to Genomes. Hartwell. L., Michael. L Gold berg., Anne E. Reynolds and Lee. M. Silver. 2009. 4th Edition. Mc Graw Hill Publication.
4. Genetics: Analysis & Principles. Robert J. Brooker 7th Edition. Mc Graw Hill Publication.
5. Genetics: Analysis of Genes and Genomes.Daniel L. Hartl 2014. 5th Edition Jones and Bartlett Publishers. Inc.
6. Principles of Genetics. Snustad Simmons. 2008. 6th Edition. John Wiley Publication.
7. Trun, N., & Trempy, J. (2009). Fundamental bacterial genetics. John Wiley & Sons.
8. Streips, U. N., & Yasbin, R. E. (Eds.). (2004). Modern microbial genetics. John Wiley & Sons.

References:

1. Advanced Genetics. G. S. Miglani. Alpha Science International, Ltd. 2012.
2. Fundamentals of Biostatistics. 2nd Edition. Khan & Khanum. 2004. Ukaaz publications.
3. Principles of Genetics, 7th Edition, Robert H. Tamarin. 2002. Tata- Mc Graw Hill Publications.
4. Theory and Problems of Genetics. W. D. Stansfield. 2002. Mc Graw Hill Publications.
5. Chromosomal Aberrations: Basic and Applied aspects by Obe.G. and A.T. Natarajan (1990) Springer Verlag, Berlin.
6. Cytogenetics, Plant Breeding and evolution by U.Sinha and Sunita Sinha , Vikas Publishing House Private, Limited, 1998.
7. Cytology, Genetics and Molecular Biology by P.K.Gupta (2002), Rastogi publications.
8. Elements of Genetics by Phundan Singh, Kalyani Publishers. 2009.
9. Genetic Maps, 6th edition by O"Brien, S (1993)
10. Instant notes in Genetics by P.C.Winter, G.I. Hickey and H.L.Fletcher (2003) Viva Books Pvt.Ltd.
11. Principles of Genetics by E.J.Gardener, M.J.Simmons and D.P.Snustad.J.Wiley and Sons pubs (1998).

Pedagogy:

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	20
Seminars/Assignment/ Minor project	15
Active learning/Problem based/Review Writing/ Paper presentation/ Case studies	05
Total	**40**

SKILL ENHANCEMENT (VOCATIONAL) ELECTIVE COURSES-SEEC
PRACTICAL PAPER: VEC5GENP1: GENETIC COUNSELING

Course Title: Genetic Counseling Code: VEC5GENP1	Course Credits: 02
Total Contact Hours: 56	Duration of ESA: 04
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (COs):

At the successful completion of the course students will have
1. Learned methods of genetic testing
2. Mastered pedigree construction, analysis and risk calculation
3. Intensive practical knowledge of Genetic Counseling.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)		1	2	3	4	5	6	7	8	9	10	11	12
I.	Core competency	x											
II.	Critical thinking	x											
III.	Analytical reasoning	x											
IV.	Research skills	x											
V.	Team work	x											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark „X" in the intersection cell if a course outcome addresses a particular program outcome.

Paper Code:	Content	Credit-02 Hours - 56
VEC5GENP1	1. Blood grouping and Rh in humans 2. Hemoglobin electrophoresis (paper electrophoresis) 3. Detection of inborn errors of metabolism–mucopolysaccharidosis, Galactosemia, PKU. 4. Human karyotyping 5. Demonstration of prenatal diagnosis 6. Chorionic villi sampling demo or virtual lab 7. Amniocentesis demo or virtual lab 8. Demonstration of Ultrasonography 9. Scoring dysmorphic features in syndromic patients 10. Genetic Counseling methods based on case history 11. Construction and analysis of Pedigree 12. Risk calculation 13. Assessment of inheritance of quantitative characters 14. To study the communication process of Genetic counseling for genetic testing.	

Textbooks:

1. Harper, P. (2010). Practical genetic counselling. CRC Press.
2. Kessler, S. (Ed.). (2013). Genetic counselling: psychological dimensions. Academic Press.
3. Stevenson, A. C., & Davison, B. C. (2016). Genetic counselling. Elsevier.
4. Evans, C. (2006). Genetic counselling: a psychological approach. Cambridge University Press.

References:

1. Atlas of Inherited Metabolic Diseases.

2. Mendelian Inheritance in Man: A Catalog of Human Genes and Genetic Disorders, Victor A. McKusick,.2 Vol I & II

3. Stacy L Blachford (Editor) 2001. The Gale Encyclopedia of Genetic Disorders. Gale Group Publishers, Vol.1 (A-L), Vol.II(M-Z).

4. Limoine, W.R. and Cooper, D.NB. 1996: Gene Trophy, Bios Scientific Pub.Oxford.

Databases:

1. Online Mendelian Inheritance in Man (OMIM)

2. Pictures of Standard Syndromes and Undiagnosed Malformations (POSSUM)

3. London Dysmorphology Database (LDDB)

Course Books published in English and Kannada may be prescribed by the Universities and College

Pedagogy:

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	10
Seminars/Assignment/Minor Project	10
Attendance	05
Total	25

II SEMESTER B.SC., GENETICS (HONS) THEORY SYLLABUS
DISCIPLINE SPECIFIC -DSC
THEORY PAPER: DSCC5GENT2- BIOINSTRUMENTATION AND ANIMAL CELL CULTURE

Course Title: Bioinstrumentation and Animal Cell Culture Code: DSCC5GENT2	Course Credits: 04
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60

Course Outcomes (COs):

At the end of the course, the students will be able to:

4. Understand the basic principles of different laboratory equipments.
5. Know the uses of the analytical equipments in various biological applications.
6. Understand the cell lines and culture media and cell culture methods

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)		1	2	3	4	5	6	7	8	9	10	11	12
I.	Core competency	x											
II.	Critical thinking	x											
III.	Analytical reasoning	x											
IV.	Research skills	x											
V.	Team work	x											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark „X" in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

	Content	Hours 56
Chapter	Unit – 1	14
1.	**Microscopy:** Introduction, and history of Microscopy **Principle and Optical Components of microscope:** Eye piece, Eye piece tube, Objective lenses, Coarse and Fine Focus knobs, Stage and stage clips, Aperture, Illuminator, Condenser, Condenser Focus Knob, Iris Diaphragm.	
2.	**Types of microscopes:** Simple and Compound microscopes, Light microscopes, Fluorescence, electron microscopy (transmission and scanning), Phase contrast, Confocal, Stereo microscopy, Optical pathway in different microscopes.	
3.	**Uses of microscopy and biological applications:** High resolution imaging, immune histochemistry, high-content screening and high-throughput imaging, Medical science, Forensic laboratories.	
Chapter	Unit – 2	14
04	**Analytical Instruments:** pH meter-principle and components of pH meter. **Thermometer:** principle, types of thermometers-digital, mercury, strip-type, Infrared, Axillary.	
05	**Colorimeter:** principles of measurement and applications. **Spectrophotometer:** Beer-Lambert's Law in spectrometry, UV spectrophotometers, Atomic absorption spectroscopy (AAS), Electron Spin Resonance (ESR), Nuclear Magnetic Resonance (NMR) Spectrophotometers, Flame photometer.	
06	**Different types of sterilization methods:** Autoclave, steam sterilizers, dry heat sterilizers and ovens and UV chambers.	
Chapters	Unit – 3	14
07	**Instruments used in separation techniques:** Centrifugation: Principle and applications of centrifuge, types of centrifuge-high speed centrifuge, ultra-centrifuge, Refrigerated centrifuge. Rotors: Types of rotors- vertical, Swing-out, Fixed angle.	
08	**Chromatography:** Principle, types and application of Chromatography-paper chromatography, ion exchange, gel filtration, HPLC, affinity chromatography.	
09	**Electrophoresis:** Principle and applications of electrophoresis. Types of electrophoresis: vertical and horizontal. **Components:** Electrodes, Power supply, electrophoresis chamber	

Chapter	Unit – 4	14
10	**Animal cell culture:** Principles of cell culture, cell types, cell lines, Primary culture, secondary culture, cryopreservation, contaminations, organotypic culture	
11	**Requirements in Animal Cell Culture:** Equipments used in Cell culture, Culture vessels, Aseptic techniques. **Cell culture media:** Natural and defined, role and components of serum in culture. *Invitro* transformation of animal cells, Types of cell culture.	
12	**Applications of cell culture:** Cell culture in biomedical research, karyological studies, amniocentesis, mutagenesis, Cytotoxicity assays.	

Text Books:

1. Alberts B, Johnson A, Lewis J, et al. "Molecular Biology of the Cell", 2002, 4th edition, New York: Garland Science.
2. Lodish H, Berk A, Zipursky SL, et al. "Molecular Cell Biology". 2000, 4th edition. New York: W.   H. Freeman.
3. R. Freshney, "Culture of Animal Cells-A Manual of Basic Technique and Specialized Applications", 2015, Seventh edition, Wiley Blackwell.
4. John M. Davis, "Animal Cell Culture: Essential Methods" 2011, John Wiley & Sons Ltd.
5. A. J. Ninfa and D. P. Ballou, *Fundamental Laboratory Approaches for Biochemistry and Biotechnology,* 1998 2nd Edition Wiley.
6. J. Sambrook and D. W. Russell, *Molecular Cloning: A Laboratory Manual,* 2001, 3rd Edition Cold Spring Harbor Laboratory Press.

References:

1. Bronzino, J. D. (1986). Biomedical engineering and instrumentation. PWS Publishing Co...
2. Willard Van Nostrand, ".Instrumental Methods of Analysis"-
3. Sharms, "Instrumental Methods", S Chand & Co.
4. Harry Bronzino E, "Handbook of Biomedical Engineering and Measurements",Reston, Virginia.
5. Jacobson & Websler, " Medicine& Clinical Engg"
6. Leslie Cromwell, " Biomedical Instrumentation and Measurements"
7. Geddes & Baker, "Principles of Applied Biomedical Instrumentation" Wiley.

Course Books published by College teachers may be used

Pedagogy:

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	20
Seminars/Assignment/ Minor project	15
Attendence	05
Total	40

Course Title: Bioinstrumentation and Animal Cell Culture Code: DSCC5GENP2	Course Credits: 02
Total Contact Hours: 56	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (COs):

At the end of the course, the students will be able to:

1. Understand the lab safety and maintenance of different laboratory equipments.
2. Operate different laboratory equipments.
3. Handle and culture different cell lines.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12
I. Core competency	x											
II. Critical thinking	x											
III. Analytical reasoning	x											
IV. Research skills	x											
V. Team work	x											

Course Content

Chapter	Content	Hrs 56
	<u>Unit - 1</u>	
	1. Demonstration of optical Components of microscope: Eye piece, Eye piece tube, Nose piece, Objective lenses, Coarse and Fine Focus knobs, Stage and stage clips, Aperture, Illuminator, Condenser, Condenser Focus Knob, Iris Diaphragm. 2. Fluorescence Microscopy: viewing cells stained with fluorescent dyes. 3. Demonstration experiments on, laser scanning, Phase contrast, confocal and scanning electron microscopy. 4. Preparation of buffers using pH meter. 5. Temperature recording using Thermometer 6. Colorimetric estimation of proteins 7. Protein estimation by Bradford reagent method. 8. Demonstration of Beer-Lambert's Law in spectrometry 9. Recording ultraviolet absorption spectra for DNA 10. Demonstration of UV spectrophotometers, Atomic absorption spectroscopy, Electron Spin Resonance (ESR), Nuclear Magnetic Resonance (NMR) Spectrophotometers, Flame photometer. 11. Chromatography: size exclusion chromatography of a crude mixture of proteins using standard matrix and dyes 12. Demonstration of components of different centrifuges. Rotors: Types of rotors- vertical, Swing-out, Fixed angle. 13. Agarose electrophoresis of DNA 14. SDS-PAGE electrophoresis of proteins 15. Demonstration of cell culture and cell lines. 16. Demonstration of sterilization methods: Autoclave, steam sterilizers, dry heat sterilizers and ovens and UV chambers.	

Text Books:
1. Alberts B, Johnson A, Lewis J, et al. "Molecular Biology of the Cell", 2002, 4th edition, New York: Garland Science.
2. Lodish H, Berk A, Zipursky SL, et al. "Molecular Cell Biology". 4th edition. New York: W. H. Freeman; 2000.
3. R. Freshney, "Culture of Animal Cells-A Manual of Basic Technique and Specialized Applications", 2015, Seventh edition, Wiley Blackwell.
4. John M. Davis, "Animal Cell Culture: Essential Methods" 2011, John Wiley & Sons Ltd.
5. A. J. Ninfa and D. P. Ballou, *Fundamental Laboratory Approaches for Biochemistry and Biotechnology,* 1998 2nd Edition Wiley.
6. J. Sambrook and D. W. Russell, *Molecular Cloning: A Laboratory Manual,* 2001, 3rd Edition Cold Spring Harbor Laboratory Press.

References:
1. Joseph Bronzino, "Biomedical Engineering and Instrumentation", PWS Engg ., Boston.
2. Willard Van Nostrand, "Instrumental Methods of Analysis"-
3. Sharms, "Instrumental Methods", S Chand & Co.
4. Harry Bronzino E, "Handbook of Biomedical Engineering and measurements", Reston, Virginia.

Course Books published by College teachers may be used

Pedagogy:

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	10
Seminars/Assignment/Minor Project	10
Active learning/Problem based/Review Writing/ Paper presentation	05
Total	25

II SEMESTER B.SC., GENETICS (HONS) THEORY SYLLABUS
OPEN ELECTIVE COURSE-OEC
THEORY PAPER: OEC5GENT2: GENETIC COUNSELLING

Course Title/Code: Genetic Counselling / OEC5GENT2	Course Credits:03
Total Contact Hours: 42	Duration of OEC: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60

Course Outcomes (COs):

Upon successful completion, each student will have the basic knowledge of

1. Genetic counselling methods

2. Reproductive risk calculation

3. Ethical and legal issues of genetic counselling

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12
I. Core competency	x											
II. Critical thinking	x											
III. Analytical reasoning	x											
IV. Research skills	x											
V. Team work	x											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark „X" in the intersection cell if a course outcome addresses a particular program outcome.

Course Content:

	Content	Hours 42
Chapter	Unit – 1	14
01	**Genetic Counselling:** Introduction; Historical over view, types and scope. Counsellor: Definition, Role, Qualities and responsibilities; Consultant- Definition, needs, Rights.	
02	**Individual counselling:** Definition, objectives, important issues in genetic counselling, Counselor's background, cultural knowledge, health benefits, family issues, building rapport, empathy in family.	

03	**Group counselling:** Definition, objectives, types of groups, theoretically oriented group counselling; Behavioral counselling; Transactional counselling; Group crisis intervention. Family counselling – Definition, objectives, selecting family therapy as the method of choice, family counselling theories and psychoanalytical therapies.	
Chapter	Unit – 2	14
04	**Process of Genetic Counselling:** Information gathering, medical evaluation, Physical examination and investigations. Medico legal case - Diagnosis based on medical history (Past medical, social and family history); Risk **Psychological aspects of counselling:** assessments – Communication, discussion of options.	
05	**Psychological aspects of counselling:** Role of social workers; Nutritional; occupational; Physical; Speech therapist; Psychologists and school professional in genetic counselling. Educating the consultant; Presenting the Risks, Options and Guiding; Diagnostics problems in Genetic counselling; Indications for genetic counselling and genetic counselling case management	
06	**Reproductive risk assessments:** Reproductive failures; consanguinity; endogamous marriages and its impact on genetic disorders.	
Chapter	Unit – 3	14
07	**Registries for Genetic Counselling:** Registries and support groups for rare medical disorders; Principles of predictive counselling and testing in late onset disorders imparting results of predictive testing; Counselling and management in follow up sessions.	
08	Ethical concerns in genetic counselling: Ethical issues in testing of minors; Prenatal diagnosis in late onset disorders; Ethical, legal and social issues (ELSI).	
09	**Acts and amendments:** The medical termination of pregnancy act 1971; The Pre- natal diagnostic techniques act 1994; Regulatory bodies of Genetic counselling – BGCI (India); ABGC (USA); CAGC (Canada).	

Text books:
1. Doing a literature review in health and social care: a practical guide, Helen Aveyard (2014).
2. Doing your research project: a guide for first-time researcher, Judith Bell with Stephen Waters (2014).
3. Facilitating the genetic counseling process: practice-based skills. Patricia McCarthy Veach, Bonnie S. LeRoy and Nancy P. Callanan (2018).

4. Family communication about genetics: theory and practice, Clara L. Gaff and Carma L. Bylund (2010).
5. Foundations of perinatal genetic counseling: a guide for counselors, Amber Mathiesen and Kali Roy (2018).
6. Gardner and Sutherland's chromosome abnormalities and genetic counselling, R.J. McKinlay Gardner and David J. Amor (2018).
7. Genetic counseling: ethical challenges and consequences, Dianne M. Bartels, Bonnie S. LeRoy, and Arthur L. Caplan (2011).
8. Genetic counseling for adult neurogenetic disease: a casebook for clinicians, Jill S. Goldman (2015).
9. Genetic counseling research: a practical guide, Ian M. MacFarlane, Patricia McCarthy Veach, Bonnie S. LeRoy (2014).
10. A guide to genetic counselling, edited by Wendy R. Uhlmann, Jane L. Schuette, Beverly M. Yashar (2009).

References:
1. Helping the client: a creative practical guide, John Heron (2001).
2. How to read a paper: the basics of evidence-based medicine, Trisha Greenhalgh (2014).
3. Make it stick: the science of successful learning, Peter C. Brown, Henry L. Roediger and Mark A. McDaniel (2014).
4. Normative and pragmatic dimensions of genetic counseling: negotiating genetics and ethics, Joseph B. Fanning (2016).
5. Practical genetic counselling, Peter S. Harper (2010).
6. Thompson & Thompson genetics in medicine, Robert L. Nussbaum, Roderick R. McInnes, Huntington F. Willard, Ada Hamosh (2016).

Pedagogy:

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	20
Seminars/Assignment/ Minor project	15
Active learning/Problem based/Review Writing/ Paper presentation/ Case studies	05
Total	**40**

Course pattern and scheme of examination for B.Sc./ B.Sc. (Hons.) as per NEP (2021-22 onwards)
Subject: GENETICS

SL No.	Semester	Title of the paper	Teaching hours	Hours / week		Examination Pattern Max. & Min. Marks /Paper						Duration of Exam (hours)		Total Marks / paper	Credits	
				Theory	Practical	Theory			Practical			Theory	Practical		Theory	Practical
						Max.	MIN.	IA	Max.	MIN.	IA					
1	I	CORE subject	56	4	4	60	22	40	25	9	25	3	3	150	4	2
		Open elective	42	3	-	60	22	40	-	-	-	3	-	100	3	-
		Skill Enhancement Course	56	-	4	-	-	-	25	9	25	-	3	50	-	2
2	II	CORE subject	56	4	4	60	22	40	25	9	25	3	3	150	4	2
		Open elective	42	3	-	60	22	40	-	-	-	3	-	100	3	-
		Skill Enhancement Course	56	-	4	-	-	-	25	9	25	-	3	50	-	2

Scheme of Internal Assessment Marks: Theory

Sl. No.	Particulars	IA Marks
1	Attendance	05
2	Internal Tests (Minimum of Two)	20
3	Assignments /Seminar / Case Study / Project work / Reports on - Field visits made for observation and collection of data etc.,	15
	TOTAL Theory IA Marks	40

Scheme of Internal Assessment: Marks Practicals

Sl. No.	Particulars	IA Marks
1	Practical Test	05
2	Submission of Project Report	05
3	Viva-voce on project report	05
4	Active participation in practical classes (Attendance)	05
5	Practical Record(s)	05
	TOTAL Theory IA Marks	25

I semester B.Sc. Genetics (HONS) Major core course-1
SCHEME OF PRACTICAL EXAMINATION
Practical Paper: Cell Biology and Genetics (DSCC5GENP1)

Duration:3Hrs   Max. Marks:25

1. Prepare a temporary squash of the onion root tip. Identify and comment on the stages with neat labeled diagram. (Mitosis).   **(6 Marks)**

<div align="center">OR</div>

   Prepare a temporary squash of the Onion flower bud/ Grasshopper Testis. Identify and comment on the stages observed.

2. Prepare the Polytene chromosome from the given material (Drosophila Larvae/ Chironomous Larvae) and comment with a neat labelled diagram   **(6 Marks)**
3. Perform the blood typing and interpret the result.   **(6 Marks)**
4. Solve the Genetic Problems   **(3.5 X 2=7 marks)**
   a. problem on Linkage
   b. problems on calculation of interference and construction of Genetic map

I semester B.Sc. Genetics (HONS) Minor discipline course-1
SKILL ENHANCEMENT (VOCATIONAL) ELECTIVE COURSES-SEEC
PRACTICAL PAPER: VEC5GENP1: GENETIC COUNSELING
PRACTICAL EXAMINATION

Duration:3Hrs   Max. Marks:25

1. Separate hemoglobin by Paper electrophoresis   (6 marks)
2. Construct the pedigree for the given data /analyse the given pedigree   (6 marks)
3. Detect the blood group of the given sample and comment on the result   (4 marks)
4. Analyse the given case history and assess the risk of occurrence.   (4 marks)
5. Identify and comment on the given spotters (a &b).   (2.5 X 2) (5 marks)

II semester B.Sc. Genetics (HONS) Minor discipline course-1
SCHEME OF PRACTICAL EXAMINATION
Practical Paper: Medical Genetics (MDC5GENP2)

Duration:3Hrs   Max. Marks:25

1. Isolate DNA/RNA from Human blood.   **(8 Marks)**

<div align="center">OR</div>

   Separation of DNA/RNA by electrophoresis.

2. Separate Hemoglobin by paper electrophoresis.   **(8 Marks)**
3. Estimate the amount of DNA/RNA by spectrophotometric method.   **(6 Marks)**
4. Analyze/ construct Pedigree or Blood group assessment/ Spotters (Karyotype)   **(3 Marks)**

II semester B.Sc. Genetics (HONS) Minor discipline course-1
SCHEME OF PRACTICAL EXAMINATION
Practical Paper: Bioinstrumentation and animal cell culture (DSCC5GNP2)

Duration:3Hrs   Max. Marks:25

1. Separate DNA by Agarose Gel electrophoresis.   **(8 Marks)**
          OR
   Separate Protein by SDS Page
2. Estimate the amount of Protein present in the given sample by Bradford's method   **(8 Marks)**
3. Write the working principle and application of
   (Microscopy / Spectrophotometer / Centrifuge)   **(3X2 =6 Marks)**
4. Prepare a buffer for the given pH.   **(3 Marks)**

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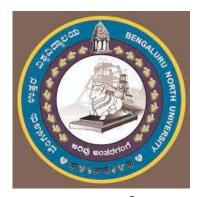
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CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: PHYSICS

2021-22 onwards

Bengaluru North University
Sri DevarajUrs Extension Behind S.P.Office, Tamaka, Kolar Karnataka-563103

Department of Physics

Syllabus for

1st& 2nd Semester Physics Papers

Under-Graduate(UG) Program

Framed according to the National Education Policy (NEP 2020)
(Effective from the Academic Year 2021-22)

Board of Studies in Physics (UG) Members

Prof VijayakumarH. Doddamani (Chairperson), Professor, Dept. Physics, Bangalore University, Bengaluru-560056
Dr. Jagadish K.N., Associate Professor**,** GFGC K.R. Pura, Bangalore 560036
Dr. K. Srinivasan, Associate Professor**,** GFGC K.R. Pura, Bangalore 560036
Dr. R. S Muralidhara, Associate Professor,GFGC Hosakote , Bengaluru (R)-562114
Sri Madhusudhan G.J., Associate Professor,GFGC K.R. Pura, Bangalore 560036
Sri   K.T. Veeranjaneya, Associate Professor,TheNational Degree College,Bagepalli-562207
Smt. E. Kalavathi, Associate Professor, GFGC Hosakote , Bengaluru (R)-562114
Smt.AnuradhaP., Associate Professor, GFGC Malur,563160

Date: 15-10-2021
Place: Bengaluru

Introduction

The NEP-2020 offers an opportunity to effect a paradigm shift from a teacher-centric to a student-centric higher education system in India. It is based on Outcome Based Education, where the Graduate Attributes are first kept in mind to reverse-design the Programs, Courses and Supplementary activities to attain the graduate attributes and learning outcomes. The learning outcomes-based curriculum framework for a degree in B.Sc. (Honours) Physics is intended to provide a comprehensive foundation to the subject and to help students develop the ability to successfully continue with further studies and research in the subject while they are equipped with required skills at various stages. The framework is designed to equip students with valuable cognitive abilities and skills so that they are successful in meeting diverse needs of professional careers in a developing and knowledge-based society. The curriculum framework considers the need to maintain globally competitive standards of achievement in terms of the knowledge and skills in Physics, as well develop scientific orientation, spirit of enquiry problem solving skills and human and professional will values which foster rational and critical thinking in the students.

Graduate attributes in Physics

Some of the characteristic attributes a graduate in Physics should possess are:
- Disciplinary knowledge and skills:
- Skilled communication:
- Critical thinking and problem-solving capacity:
- Sense of inquiry:
- Team player/worker:
- Project Management Skills:
- Digital and ICT efficiency:
- Ethical awareness / reasoning:
- National and international perspective:
- Lifelong learning

Flexibility

- The programs are flexible enough to allow liberty to students in designing them according to their requirements. Students may choose a single Major, one Major with a Minor, and one Major with two Minors. Teacher Education or Vocational courses may be chosen in place of Minor/s. Below listed are the various options students may choose from.
- One Major subject/discipline, Two Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities.
- One Major and one Minor subject/discipline along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities
- Two Major subject/disciplines along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses, including Extracurricular Activities (subject to fulfilling the requirements as stated in 3.i and 3.ii)
- One Major subject/discipline and one Vocational course along with Languages, Generic Electives, Ability Enhancement and Skill Development and courses including Extracurricular Activities.
- One Major Discipline and One Education Discipline along with Languages, Generic Electives, Ability Enhancement and Skill Development Courses including Extracurricular Activities.

Progressive Certificate, Diploma, bachelor's degree, or bachelor's degree with Honours will be provided at the End of Each Year of Exit of the Four-year Undergraduate program/Five-year Integrated Master's Degree program.

EXIT OPTIONS	Credits required
Certificate upon the Successful Completion of the First Year (Two Semesters) of the multidisciplinary Four-year Undergraduate Program/Five-year Integrated Master's Degree Program	44 - 48
Diploma upon the Successful Completion of the Second Year (Four Semesters) of the multidisciplinary Four-year Undergraduate Program/Five-year Integrated Master's Degree Program	88 - 96
Basic bachelor's degree at the Successful Completion of the Third Year (Six Semesters) of the multidisciplinary Four- year Undergraduate Program/Five-year Integrated Master's Degree Program	132 - 144
Bachelor's degree with Honours in a Discipline at the Successful Completion of the Fourth Years (Eight Semesters) of the multidisciplinary Four-year Undergraduate Program/Five-year Integrated Master's Degree Program	176 - 192
Master's Degree in a Discipline at the Successful Completion of the Fifth Year (Ten Semesters) of the Five- year Integrated Master's Degree Program	224- 240

Aims and objectives of UG program in Physics

The aims and objectives of our UG educational programs in sciences in general and Physics in particular should be structured to:

- Create the facilities and environment in all the educational institutions to consolidate the knowledge acquired at +2 level and to motivate and inspire the students to create deep interest in Physics, to develop broad and balanced knowledge and understanding of physical concepts, principles, and theories of Physics.
- Learn, design, and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.
- Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Physics.
- Expose the student to the vast scope of Physics as a theoretical and experimental/ observational science with applications in solving most of the problems in nature spanning from 10^{-15} m to 10^{26}m in space and 10^{-10} eV to 10^{25}eV in energy dimensions.
- Emphasize the discipline of Physics to be the most important branch of science for pursuing the interdisciplinary and multidisciplinary higher education and/or research in interdisciplinary and multidisciplinary areas.
- To emphasize the importance of Physics as the most important discipline for sustaining the existing industries and establishing new ones to create job opportunities at all levels of employment.

The progressive curriculum shall position knowledge and skills required on thetransformation of novice problem solvers (at entry level of the program) to expert problem solvers (by the time of graduation) as given below:

- ➢ At the end of first year – Ability to solve well defined problems
- ➢ At the end of second year – Ability to solve broadly defined problems
- ➢ At the end of third year – Ability to solve complex problems that are ill-structure that require multi-disciplinary skills to solve them
- ➢ During fourth year – Experience of work-place problem solving in the form of internship or Research Experience preparing for higher education or Entrepreneurship and employment.

Curriculum Framework for Multidisciplinary Four- year Undergraduate Program/ Five-year Integrated Master's Degree Program

Year	Objectives	Nature of Courses	Outcome	No. of courses
1st year – **(1st & 2nd semesters)**	Understanding and Exploration	1. Major Core Courses 2. Minor/Related Discipline 3. Languages, 4. Ability Enhancement Compulsory Courses 5. Skill Enhancement/ Development Courses	Understanding of Disciplines Language Competency Gaining perspective of context/Generic skills Basic skills set to pursue any vocation	1+1 1+1 2+2 1+1 1+1
Exit option with Certification				
2nd Year - **(3rd & 4th Semesters)**	Focus and Immersion	1. Major Core Courses 2. Minor/ Related Discipline 3. Ability Enhancement 4. Skill based Vocational 5. Extra - Curricular Activities	Understanding of disciplines Gaining perspective of context Skill sets to pursue vocation Development of various Domains of mind &Personality	2+2 1+1 1+1 1+1 1+1
Exit Option with Diploma				
3rd Year - **(5th & 6th Semesters)**	Real time Learning	1. Major Discipline Core and Elective Courses 2. Minor Discipline/ Generic or Vocational Electives/Field based Learning/ Research Project	In depth learning of major and minor disciplines, Skill sets for employability. Exposure to discipline beyond the chosen Subject Experiential learning/ Research.	2+2 1+1 1+1
Exit option with bachelor's degree				
4th Year - **(7th &8th Semesters)**	Deeper Concentration	Major Discipline Core and Elective coursesResearch/Project Work with Dissertation	Deeper and Advanced Learning of Major Discipline Foundation to pursue Doctoral Studies & Developing Research competencies	4+4
Bachelor's degree with Honours				
5th Year - (9th & 10th Semesters)	Master of the subject	Major Discipline Core and Electivecourses/ Research/ProjectWork with Dissertation	Deeper and Advanced Learning of the Major Discipline towards gaining proficiency over the subject	4+4/6+6
Master's Degree				

CourseStructure

(Major Discipline: Physics)
Semester 1- 10

SEMESTER	Discipline Core Theory (DSCT)	Core Papers
SEMESTER-1	Phy.DSCT1	Mechanics&Propertiesof Matter (Select one of Open Electives papers Phy-OE1/ Phy-OE2)
SEMESTER -2	Phy.DSCT2	ElectricityandMagnetism (Select one of Open Elective papers Phy-OE3 / Phy-OE4)
SEMESTER -3	Phy.DSCT3	Wavemotionandoptics (Select one of Open Electives papers Phy-OE5 / Phy-OE6)
SEMESTER -4	Phy.DSCT4	ThermalPhysics&Electronics (Select one of Open Elective papers Phy-OE7 / Phy-OE8 / Phy-OE9)
SEMESTER -5	Phy.DSCT5 Phy.DSCT6	1.Classical Mechanics andQuantumMechanics-I 2. Elements of Atomic,MolecularPhysics
SEMESTER -6	Phy.DSCT7 Phy.DSCT8	1.Elementsof Nuclear PhysicsandNuclearInstruments 2.Elementsof Condensed MatterPhysics
SEMESTER -7	Phy.DSCT9 Phy.DSCT10 Phy.DSCT11	1. Mathematical Methods of Physics – I 2. Classical Electrodynamics. 3. Experimental methods of Physics 4. ResearchMethodology
SEMESTER -8	Phy.DSCT12 Phy.DSCT13 Phy.DSCT14	1. Classical Mechanics andQuantumMechanics-II 2. StatisticalMechanics 3. Astrophysics&Astronomy 4. ResearchProject* (Select Two DSE subjects from the Pool B-II shown below) *In lieu of the research Project, two additional elective papers/ Internship may be offered.
SEMESTER -9	Phy.DSCT15	1. Mathematical Methods of Physics – II (Select One DSE subjects from the Pool B-III shown below) 2. Research Project
SEMESTER -10	Phy.DSCT17	1. Quantum Mechanics – III (Select One DSE subjects from the Pool B-IV shown below) 2. Research Project

OpenElectives

1st Semester	
1.	Phy-OE1: EnergySources
2.	*Phy-OE2: Physics for All.
2nd Semester	
3.	Phy-OE3: Atmospheric Science
4.	Phy-OE4: SportsScience
3rd Semester	
5.	Phy-OE5: Optical Instruments
6.	Phy-OE6: Elements of Astronomy and Astrophysics
4th Semester	
7.	Phy-OE7: MedicalPhysics
8.	Phy-OE8: Nanotechnology
9.	Phy-OE9: ElectricalInstruments

*Students who have chosen Phy-DST1 are not eligible to take Open Elective paper Phy-OE2.

Discipline Specific Electives for 7 to 10 Semesters

7th SemElectives Pool B-I (Select any two)		8th Sem Electives Pool B-II (Select any two)	
A.	Condensed Matter Physics-1	A.	Atomic&Molecular Physics-1
B.	Nuclear and Particle Physics	B.	MaterialsPhysics&Nano materials
C.	TheoreticalandComputationalPhysics-I	C.	Lasers and non-linear optics
D.	Biophysics	D.	Plasma Physics
E.	Astronomy and Astrophysics	E.	Physics of Semiconductor devices

9th SemElectives(Specialization papers) Pool B-III		10th Sem Electives(Specialization papers) Pool B-IV	
A.	Condensed Matter Physics-2	A.	Condensed Matter Physics-3
B.	Nuclear and Particle Physics-2	B.	Nuclear and Particle Physics-3
C.	Atomic&Molecular spectroscopy 1	C.	Atomic&Molecular spectroscopy 2
D.	MaterialsPhysics&Nanophysics–1	D.	MaterialsPhysics&Nanophysics-2
E.	TheoreticalandComputationalPhysics-I	E.	TheoreticalandComputationalPhysics-2
F.	Astronomy and Astrophysics-1	F.	Astronomy and Astrophysics-2

Detailed Syllabus for 1st & 2nd Semesters

1st Semester

Phy-DSCT1: Mechanics and Properties of Matter	Course Credits (L+T+P) : 4+0+2
Total Contact Hours: 52	Duration of ESA: 3 Hours

Course Outcomes (COs):

1. Fixing units, tabulation of observations, analysis of data(graphical/analytical).
2. Accuracy of measurement and sources of errors, importance of significantfigures.
3. Knowledge of how g can be determined experimentally and derivesatisfaction.
4. Understanding the difference between simple and torsional pendulum and their use in the determination ofvarious physicalparameters.
5. Knowledge of how various elastic moduli can bedetermined.
6. Measuring surface tension and viscosity and appreciate the methodsadopted.
7. Hands on experience of differentequipment.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6
Fixing units, tabulation of observations, analysis of data(graphical/analytical)	√					
Accuracy of measurement and sources of errors, importance of significantfigures		√				
Knowledge of how g can be determined experimentally and derive satisfaction.	√					
Understanding the difference between simple and torsional pendulum and their use in the determination ofvarious physicalparameters					√	
Knowledge of how various elastic moduli can bedetermined	√					
Measuring surface tension and viscosity and appreciate the methodsadopted	√					
Hands on experience of differentequipment.	√					

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. <mark>Mark '√' in the intersection cell indicatesthe course outcome of a particular program.</mark>

Course Content **Phy. DSCT1: Mechanics & Properties of Matter**		**Hrs**
Unit – 1 (13 Hours of teaching includes 3 Hours of activities. Problems are to be worked out from each unit)		
Chapter No. 1	**Units and measurements:** System of units (CGS and SI), measurement of length, mass and time, dimensions of physical quantities, dimensional formulae[review]. Mean deviation, errors and types of errors.	2
Chapter No. 2	**Momentum and Energy**: Work and energy, Conservation of linear momentum, Conservation of energy with examples,	2
Chapter No. 3	**Frames of reference:**Inertial and non- inertial frames, Galilean transformation, Principle of invariance, accelerated frames and Michelson -Morley Experiment.	3
Chapter No. 4	**Special Theory of Relativity**: Lorentz transformations, Constancy of speed of light. Postulates of Special Theory of Relativity. Lorentz transformation equations, Length contraction. Time dilation. Relativistic addition of velocities , mass -energy equivalence $(E = mc^2)$	6
Topics for Self-study	Variable mass problem & Rocket motion Twin paradox	
	Suggested Activities	
Activity No. 1	i). Measure diameters of small balls of different size and estimate their volumes. ii). Measure lengths of nails of differentsize. iii). Measure volume of aliquid. iv). Measure distances and put the result both in CGS and SI units in 2, 3 and 4significant figures. Mention the precession of themeasurement. v). Estimate standard deviations wherever possible.	
Activity No. 2	Understand conservation of energy in everyday examples like i) What happens in solar energy conversion panels ii) Pushing an object on the table itmoves iii) Moving car hits a parked car causes parked car tomove. In these cases, it is known that energy is conserved. How? Understand and verify if possible.	

	Unit – 2 (13 Hours of teaching includes 3 Hours of activities)	
	Unit – 2 **(13 Hours of teaching includes 3 Hours of activities)**	
Chapter No. 5.	**Laws of Motion:** Newton's Laws of motion, Dynamics of single particle and a system of particles, Centre of mass.	3
Chapter No. 6.	**Dynamics of Rigid bodies**: Rotational motion about an axis, Relation between torque and angular momentum, Rotational energy, Moment of inertia (MI): MI of a rectangular lamina and solid cylinders, Flywheel, Theory of compound pendulum and determination of g.	6
Chapter No. 7.	**Gravitation:** Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's laws (statements). Satellite in a circular orbit.	4
Topics for self-study(If any)	Geosynchronous orbits Basic idea of global positioning system (GPS).	
	Suggested Activities	
Activity No. 3	Moment of inertia is an abstract concept. It simply gives a measure of rotational inertia of a rigid body, and it is proportional to the product of the square of radius, r of the body and its mass, m. Refer to different websites to construct and perform simple experiments to verify that M.I.	
	Reference : www.khanacademy.org, www.pinterest.com, www.serc.cerleton.edu	
Activity No. 4	Prepare suitable charts and give seminar talks in the class.	
	Reference : Weblink/YouTube/Books/ebooks/pdfs/PPTs	
Chapter No. 8	**Unit – 3** **(13 Hours of teaching includes 3 Hours of activities)** **Elasticity:**Hooke's law - Stress-strain diagram, elastic moduli-relation between elastic constants, Poisson's Ratio-expression for Poisson's ratio in terms of elastic constants. Work done in stretching and work done in twisting a wire-Twisting couple on a cylinder. Beams, bending of beams, expression for bending moment, theory of single cantilever. **Chapter 9:**Torsional pendulum, expression for time-period of	13

	torsional oscillations, determination of rigidity modulus (static and dynamic methods) and moment of inertia, determination of q, η and σ by Searle's double bar with necessary theory.	
Topics for self-study	Time period of oscillations of a spring-mass system with non-negligible mass of the spring.	
	Suggested Activities	
Activity No. 5	Arrange a steel spring with its top fixed with a rigid support on a wall and a meter scale along side. Add 100 g load at a time on the bottom of the hanger in steps. This means that while putting each 100g load, we are increasing the stretching force by 1N. Measure the extension for loads up to 500g. Plot a graph of extension versus load. Shape of the graph should be a straight line indicating that the ratio of load to extension is constant. Go for higher loads and find out elastic limit of the material.	
	Reference : Weblink/YouTube/Books/ebooks/pdfs/PPTs	
Activity No.6	Repeat the above experiment with rubber and other materials and find out what happens after exceeding elastic limit. Plot and interpret.	
	Reference : Weblink/YouTube/Book	
Unit – 4 **(13 Hours of teaching includes 3 Hours of activities)**		
Chapter No. 10	**Surface tension:** Definition of surface tension. Surface energy, relation between surface tension and surface energy, pressure difference across curved surface, excess pressure inside spherical liquid drop, angle of contact, examples	7

Chapter No. 11	**Viscosity:** Streamline flow, turbulent flow, equation of continuity, determination of coefficientof viscosity by Poiseuille's method, Stoke'smethod.	6
Topics for self-study(If any)	Natural phenomena involving viscosity and surface tension.	
	Suggested Activities	

Activity No.7	Measure surface tension of water and other common liquids and compare andlearn
	    i) Why water has high ST? think ofreasons.
	    ii)Check whether ST is a function of temperature? You can do it by heating the water to different temperatures and measureST.
	    iii) Plot ST versus T and learn how it behaves.
	Mix some quantity of kerosene or any oil to water and measure ST. Check whether ST for the mixtureis more or less than pure water. Think ofreasons.	

	Reference : Weblink/YouTube/ Books/ebooks/pdfs/PPTs	

Activity No. 8	Collect a set of different liquids and measure theirviscosity.
	    i) Find out whether sticky or non sticky liquids are most viscous. Think ofreasons.
	    ii) Mix non sticky liquid to the sticky liquid in defined quantities and measure viscosity.Find out viscosity is increasing or decreasing with increase of non-sticky liquidconcentration.
	    iii)Do the above experiment by mixing sticky liquid to the non-sticky liquid. Find out change inviscosity with increase of concentration of stickyliquid.
	Think why anyone should know viscosity of aliquid.	

	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	

Textbooks

Sl No	Title of the Book	Author(s)	Publisher	Year of Publication
1	Mechanics	D. S. Mathur	S.Chand &Co.	2000
2	Mechanics and Relativity (3rd Edition)	Vidwan Singh Soni,	PHI Learning Pvt.Ltd.	2013
3	Mechanics (In SI Units): Berkeley Physics Course Vol 1	Charles Kittel, Walter Knight, et al	TataMcGraw-Hill	2007
4	Properties of Matter	Brijlal&Subrahmanyam	S.Chand &Co.	2002

References Books

Sl No	Title of the Book	Author(s)	Publisher	Year of Publication
1	Principles of Physics	David Halliday, Jearl Walker & Robert Resnick	Wiley India Pvt. Ltd	2010
2	Physics (8th Edition)	David Halliday & Robert Resnick	Wiley India Pvt Ltd	2008

Paper Code: Phy-DSCP1 - Lab I
List of Experiments to be performed in Lab I
[Error Analysis to be included in at least threeexperiments]

1.	Error Analysis, Data Analysis and graphing techniques to be learnt(Mandatory)
2	Determination of g using bar pendulum (L versus T and L versus LT^2 graphs)
3.	Determination of moment of inertia of a Fly Wheel.
4	Determination of rigidity modulus using torsional pendulum
5.	Verification of parallel and perpendicular axis theorems.
6	Determine the Young's Modulus a bar by uniform bending method
7	Determination of elastic constants of a wire by Searle's method
8	Young's modulus by Koenig's method
9	Modulus of rigidity of a rod –Static torsion method.
10	Viscosity by Stoke's method
11.	Verification of Hooke's law.
12.	Determination of surface tension of a liquid and the interfacial tension between two liquids using drop weight method.

13.	Critical pressure for streamline flow
14.	Determine the Young's Modulus a bar by single cantilever method.
15.	Study of motion of a spring and to calculate Spring constant, g, and unknown mass.

Note: A minimum of EIGHT experiments to be carried out

Reference Books for Laboratory Experiments

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics through experiments	B.Saraf	Vikas Publications	2013
2	A laboratory manual of Physics for undergraduate classes, 1st Edition,	D P Khandelwal	Vikas Publications.	1985
3	B.Sc. Practical Physics (Revised Edition)	C. L Arora	S.Chand & Co.	2007
4	An advanced course in practical physics.	D. Chattopadhyay, PC Rakshit, B.Saha	New Central Book Agency Pvt Ltd.	2002

Course Content: 2nd Semester

Phy-DSCT2: Electricity and Magnetism	Course Credits (L+T+P) : 4+0+2 =4
Total Contact Hours: 52	Duration of ESA: 3 Hours

Course Outcomes (COs):
1. Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges.
2. Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.
3. Apply Gauss's law of electrostatics to solve a variety of problems.
4. Describe the magnetic field produced by magnetic dipoles and electric currents.
5. Explain Faraday-Lenz and Maxwell laws to articulate the relationship between electric and magnetic fields.
6. Describe how magnetism is produced and list examples where its effects are observed.
7. Apply Kirchhoff's rules to analyze AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor, and inductor.
8. Apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity, maximum Power Transfer, etc. and their applications in electronics, electrical circuit analysis, and electrical machines.

Course Articulation Matrix: Mapping of Course Outcomes (COs)with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6
Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point, line, surface, and volume distributions of charges.	√	√				
Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.	√					
Apply Gauss's law of electrostatics to solve a variety of problems.	√	√			√	
Describe the magnetic field produced by magnetic dipoles and electric currents.	√					
Explain Faraday-Lenz and Maxwell laws to articulate the relationship between electric and magnetic fields.	√					
Describe how magnetism is produced and list examples where its effects are observed.	√				√	√
Apply Kirchhoff's rules to analyze AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor.	√	√			√	√
Apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity,• Maximum Power Transfer, etc. and their applications in electronics, electrical circuit analysis, and electrical machines.	√	√			√	√

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. <mark>Mark '√' in the intersection cell indicates the course outcome of a particular program.</mark>

Course Content Phy-DSCT2:Electricity and Magnetism		Hrs
Unit – 1 **(13 Hours of teaching includes 3 Hours of activities Problems are to be worked out from every unit.)**		
Chapter No. 1	**Electric charge and field:** Electric charge, field ,potential ,Gauss law (review), applications of Gauss law	3
Chapter No. 2	**Electrostatic Potential:** Electric potential, line integral, gradient of a scalar function, relation between field and potential. Constant potential surfaces, Potential due to a dipole and electric quadrupole.	4

Chapter No. 3	**Network Theorems:** Thevenin's theorem, Norton's Theorem, Superposition Theorem and Maximum power transfer theorem: Statements and proofs. Application to dc circuits	6
Topics for self-study	Concept of Voltage and Current Sources, Kirchhoff's Laws	
	Suggested Activities	
Activity No. 1	(i) Learn the difference between and DC and AC electricity and their characteristics. (ii) Voltage and line frequency standards in different countries. (iii) A small project report on production of electricity as a source of energy: Different methods	
	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	
Activity No. 2	(i) Learn to use a multimeter (analog and digital) to measure voltage, current and resistance. Continuity testing of a wire. (ii) Learn about household electrical connection terminals: Live, neutral and ground and voltage between the terminals. Role of earthing and safety measures	
	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	
Unit – 2 **(13 Hours of teaching includes 3 Hours of activities)**		
Chapter No. 4.	**Conductors in electrostatic field:** Conductors and insulators, conductors in electric field. Capacitance and capacitors, expression for capacitance in a parallel plate capacitor, parallel plate capacitor with dielectric, Dielectrics: an atomic view. Energy stored in a capacitor, Dielectric and Gauss's law.	6
Chapter No. 5.	**DC Currents:** Electric currents and current density. Electrical conductivity and Ohm's law. Physics of electrical conduction, conduction in metals and semiconductors, circuit elements and circuits: Transient currents in RC, LR and LCR circuits. Force on a moving charge.	7
Topics for self-study(If any)	Currents and voltage in combination of R, L and C circuits	

	Suggested Activities	
Activity No. 3	(i) Learn about electrical appliances which work with AC and DC electricity. (ii) Learn about types of resistors and their colour codes and types of capacitors(electrolytic and non-electrolytic)	
	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	
Activity No. 4	(i) Learn about power transmission: 3-phase electricity, voltage, and phase (ii) Visit a nearby electrical power station. Interact with line men, Electrical engineers and managers. Discuss about power loss in transmission. How to reduce it? (iii)Prepare a small project report on street lighting and types of electrical bulbs.	
	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	
Unit – 3 **(13 Hours of teaching includes 3 Hours of activities)**		
Chapter No.6	**Magnetism:** Force on a moving Charge in a magnetic field, Lorentz force, Force on a current carrying conductor in a uniform magnetic field, Biot -Savart's law, field due to a straight conductor carrying current, force and torque on a current loop in a magnetic field ,Principle and theory of a moving coil galvanometer, Theory of HTG , Ampere's circuital law, EMI, Faraday's law, Lenz's law, Expression for self-inductance , energy stored in an inductor.	8
Chapter No. 7	**AC circuits:** RMS and average value of AC, Response of series RL, RC, LC, LCR circuits using j-operator method, quality factor, admittance and impedance, power and energy in AC circuits.	5
Topics for self-study (If any)	Response of parallel RL, RC, LC, LCR circuits using j-operator method	
	Suggested Activities	
Activity No. 5	(i) Prepare a small project report on street lighting and types of electrical bulbs. (ii) Learn the measurement of electric current using tangent galvanometer.	

	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	
Activity No.6	Build a small coil with insulated copper wire. Connect an ammeter micro/milli ammeter. Verify magnetic induction using a powerful bar magnet.	
	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	
Unit – 4		
Chapter No. 8	**Electromagnetic waves:** Equation of continuity, Maxwell's equations, displacement current, equation for propagation of electromagnetic wave, transverse nature of electromagnetic wave, energy transported by electromagnetic waves. Poynting vector,Electromagnetic waves in conducting media and skin effect.	8
Chapter No. 9	**Magnetic materials:** Magnetic intensity and magnetic induction, Intensity of magnetization, Susceptibility, Permeability, Types of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials. Classical Langevin' s theory of para magnetism and diamagnetism, B-H hysteresis curves, Hard and soft magnetic materials.	5
Topics for self-study(If any)	1. Super conductivity 2. At least two Applications of magnetic materials	
	Suggested Activities	
Activity No.7	(i) Prepare a small project report on production of magnetic field: Permanent magnets, electromagnets and superconducting magnets. (ii) Learn the principle of working of a Gauss meter to measure magnetic field	
	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	
Activity No. 8	(i) Model the earth's magnetic field with a diagram. (ii) Explain the effect of tilt of the earth's axis and reasons for the change in the tilt of the earth's axis over thousands of years.	
	Reference : Weblink/Youtube/Book/ebooks/pdfs/PPTs	

Textbooks

Sl No	Title of the Book	Author(s)	Publisher	Year of Publication
1	Physics-Part-II,	David Halliday and Robert Resnick	Wiley Eastern Limited	2001
2	Berkeley Physics Course, Vol-2, Electricity and Magnetism, Special Edition	Edward M Purcell	Tata Mc Graw-Hill Publishing Company Ltd, New Delhi	2008

<div align="center">

Code: Phy-DSCP1-Lab II
List of Experiments to be performed in Lab II

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1.	Determination of high resistance by leakage using B.G.
2.	Determination of mutual inductance using BG.
3.	L and C by equal Voltage method.
4.	Charging and discharging of a capacitor (energy dissipated during charging, **Dielectric constant** and time constant measurements).
5.	Verification of the Thevenin's Theorem
6.	Verification of the Maximum power transfer theorem.
7.	Verification of the superposition theorem
8.	Black box: Identification of elements and measurement of their values
9.	Impedance of series RC circuits - determination of frequency of AC.
10.	Frequency response of LCR Series resonance circuit.
11.	Frequency response of LCR Parallel resonance circuit.
12.	Verification of laws of combination of capacitances and determination of unknown capacitance using de-Sauty bridge.
13.	Maxwell's impedance bridge to determine L.
14.	Determination of B_H using Helmholtz double coil galvanometer and potentiometer.

Note: A minimum of EIGHT experiments to be performed.

Reference Books for Laboratory Experiments

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics through experiments	B. Saraf	Vikas Publications	2013
2	A laboratory manual of Physics for undergraduate classes, 1st Edition,	D P Khandelwal	Vikas Publications.	1985
3	B.Sc. Practical Physics (Revised Edition)	C. L Arora	S.Chand& Co.	2007
4	An advanced course in practical physics.	D. Chattopadhyay, PC Rakshit, B. Saha	New Central Book Agency Pvt Ltd.	2002

Open Elective Papers
Phy-OE1: Energy Sources (Credits:3)
3Hours of teaching per week

Unit-I: Non-Renewable energy sources	Hrs.
Introduction: Energy concept-sources in general, its significance & necessity, Classification of energy sources: Primary and Secondary energy, Commercial and Non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy, Based on Origin-Examples and limitations. Importance of Non-commercial energy resources (4 Hours) **Conventional energy sources:**Fossil fuels & Nuclear energy- production & extraction, usage rate and limitations. Impact on environment and their issues & challenges. Overview of Indian & world energy scenario with latest statistics- consumption & necessity. Need of eco-friendly & green energy & their related technology. (8 Hours)	13
Unit-II:Renewable energy sources	
Introduction: Need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity. (05 Hours) **Solar energy**:Solar Energy-Key features, its importance, Merits & demerits of solar energy,Applications of solar energy. Solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell -brief discussion of each. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems. (8 Hours)	13

Unit -3 **Wind and Tidal Energy harvesting**:Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies, Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices, Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy. (8 Hours) **Geothermal and hydro energy:** Geothermal Resources, Geothermal Technologies (2 Hours), Hydropower resources, hydropower technologies, environmental impact of hydro power sources (3 Hours), Carbon captured technologies, cell, batteries, power consumption (1 hour)	**13**

Suggested Activities

1. Demonstration of on Solar energy, wind energy, etc, using training modules at Labs.

2. Conversion of vibration to voltage using piezoelectric materials.

3. Conversion of thermal energy into voltage using thermoelectric (using thermocouples or heat sensors) modules.

4. Project report on Solar energy scenario in India

5. Project report on Hydro energy scenario in India

6. Project report on wind energy scenario in India

7. Field trip to nearby Hydroelectric stations.

8. Field trip to wind energy stations like Chitradurga, Hospet, Gadag or or any suitable Wind Energy stations.

9. Field trip to solar energy parks like Yeramaras near Raichur or any suitable Solar park.

10. Videos on solar energy, hydro energy and wind energy.

Reference Books

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi

2. Solar energy - M P Agarwal - S Chand and Co. Ltd.

3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.

4. Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, Oxford University Press, in association with The Open University.

5. Dr. P Jayakumar, Solar Energy: Resource Assessment Handbook, 2009

6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

7. http://en.wikipedia.org/wiki/Renewable_energy

8. **Phy-OE2: Physics for all (Credits:3)3 Hours of teaching per week**

Unit-I	Hrs.
Energy and Power: Explosions and energy; Energy, heat and its units; Energy table and discussions; Discussion of cost of energy; Measuring energy; Power; Different power sources; Kinetic energy.	13
Unit-II	
Gravity, Force and Space: The force of Gravity; Newton's third law; Weightlessness; Low earth orbit; Geosynchronous satellites; Spy satellites; Medium Earth Orbit satellite; Circular Acceleration; momentum; Rockets; Airplanes, helicopters and fans; Hot air and helium balloons; angular momentum and torque.	13
Unit-III	
Nuclei and radioactivity: Radioactivity; Elements and isotopes; Radiation and rays; Seeing radiation; The REM – The radiation poisoning; Radiation and cancer; The linear hypothesis; Different types of radiation; The half-life rule; Smoke detectors; measuring age from radioactivity; Environmental radioactivity; Glow of radioactivity; Nuclear fusion.	13

References Book

This course is extracted from the book titled "Physics and Technology for Future Presidents: An Introduction to the Essential Physics Every World Leader Needs to Know" by Richard A Muller, WW Norton and Company, 2007. (Units 1 to 3 are from chapters 1, 3, 4 respectively).

Phy-OE3:Atmospheric Science(Credits:3)3 Hours of teaching per week

Unit-I	Hrs.
Atmosphere: Atmospheric Science (Meteorology) as a multidisciplinary science. Physical and dynamic meteorology, some terminology, difference between weather and climate, weather and climate variables, composition of the present atmosphere: fixed and variable gases, volume mixing ratio (VMR), sources and sinks of gases in the atmosphere. Greenhouse gases. Structure (layers) of the atmosphere. Temperature variation in the atmosphere, temperature lapse rate, mass, pressure and density variation in the atmosphere. Distribution of winds.	13
Unit-II	
Climate Science: Overview of meteorological observations, measurement of temperature, humidity, wind speed and direction and pressure. Surface weather stations, upper air observational network, satellite observation. Overview of clouds and precipitation, aerosol size and concentration, nucleation, droplet growth and condensation (qualitative description). Cloud seeding, lightning and discharge. Formation of trade winds, cyclones. Modelling of the atmosphere: General principles, Overview of General Circulation Models(GCM) for weather forecasting and prediction. Limitations of the models. R and D institutions in India and abroad dedicated to climate Science, NARL, IITM, CSIR Centre for Mathematical Modeling and Computer Simulation, and many more.	13
Unit-III	
Global Climate Change: Greenhouse effect and global warming, Enhancement in concentration of carbon dioxide and other greenhouse gases in the atmosphere, Conventional and non-conventional energy sources and their usage. EL Nino/LA Nino Southern oscillations. Causes for global warming: Deforestation, fossil fuel burning, industrialization. Manifestations of global warming: Sea level rise, melting of glaciers, variation in monsoon patterns, increase in frequency and intensity of cyclones, hurricanes, tornadoes.	13

Geo-engineering as a tool to mitigate global warming, Schemes of geo-engineering.	

Suggested Activities

1. Try to find answer to the following questions:

   (a) Imagine you are going in an aircraft at an altitude greater than 100 km. The air temperature at that altitude will be greater than 200°C. If you put your hands out of the window of the aircraft, you will not feel hot.

   (b) What would have happened if ozone is not present in the stratosphere.

2. Visit a nearby weather Station and learn about their activities.

3. Design your own rain gauge for rainfall measurement at your place.

4. Learn to determine atmospheric humidity using wet bulb and dry bulb thermometers.

5. Visit the website of Indian Institute of Tropical Meteorology (IITM) and keep track of occurrence and land fall of cyclone prediction.

6. Learn about ozone layer and its depletion and ozone hole.

7. Keep track of melting of glaciers in the Arctic and Atlantic region through data base available over several decades.

8. Watch documentary films on global warming and related issues (produced by amateur film makers and promoted by British Council and BBC).

Reference Books

1. Basics of Atmospheric Science – A Chndrashekar, PHI Learning Private Ltd. New Delhi, 2010.

2. Fundamentals of Atmospheric Modelling- Mark Z Jacson??, Cambridge University Press, 2000.

Phy-OE4: Sports Science(Credits:3)
3 Hours of teaching per week

Unit-I	Hrs.
Measurement: Physical quantities, Standards and Units, International system of Units, Standards of time, length and mass, Precision and significant figures (4 Hours) **Newton's laws of motion**: Newton's first law. Force, mass. Newton's second law. Newton's third law, Mass and weight. Applications of Newton's laws. (5 Hours) **Projectile motion**: Shooting a falling target, Physics behind Shooting, Javelin throw and Discus throw. (4 Hours) **Topics for self-study:** https://www.real-world-physics-problems.com/physics-of_sports.html	**13**

Unit-II	
Conservation laws: Conservation of linear momentum, collisions – elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing) (4 Hours) **Centre of mass**: Physics behind Cycling, Rock climbing, Skating (5 Hours) **Gravitation**: Origin, Newton's law of gravitation, Archimedes' s principle, Buoyancy & Physics behind swimming (4 Hours) **Topic for self-study:** Archimedes' Principle: Made EASY	Physics in You tube	**13**

Unit-III	
Food and Nutrition: Proteins, Vitamins, Fat, Blood pressure. Problems due to the deficiency of vitamins. (4 Hours) **Energy:** Different forms of Energy, Conservation of mass-energy (3 Hours) **Physical exercises:** Walking, Jogging and Running, Weight management. (3 Hours) **Topic for self-study:** 10 Best Exercises for Everyone – Health-line	**13**

Suggested Activities

1. Identify the methods of measurement of time, length and mass from ancient time and build models for them. **(**Reference : History of measurement - Wikipedia*https://en.wikipedia.org › wiki › History_of_measurement*)
2. Identify Physics principles behind various Sports activities.
   https://www.real-world-physics-problems.com/physics-of-sports.html

3. List the difficulties experienced in Gymnastics, Cycling and Weightlifting.

4. List the difficulties experienced in swimming.

5. Learn breathing exercises.

6. Write an essay on Physical health v/s Mental health or conduct a debate on Physical health v/s Mental health.

Textbooks

1. Yakov Perelman. Physics for Entertainment.Createspace Independent Pub, 2010.
2. Yakov Perelman. Physics Everywhere. ProdinnovaPublishers, 2014.
3. Yakov Perelman. Mechanics for Entertainment. Prodinnova Publishers, 2014.
4. VassiliosMcInnesSpathopoulos. An Introduction to the Physics of Sports.Createspace Independent Publishing Platform, 2013.
5. Walter Lewin. For the Love of Physics. Taxmann Publications Pvt. Ltd., 2012.
6. Swaminathan M. Handbook of Food and Nutrition. Bangalore Press. 2012.
7. Srilakshmi B. Food Science. New Age International Pub. 2015.

Internet Resources for Reference: Internet resources

https://www.topendsports.com/biomechanics/physics.htm

https://www.real-world-physics-problems.com/physics-of-sports.html

https://www.healthline.com/

https://www.mayoclinic.org/

https://www.who.int/news-room/

COURSE PATTERN & SCHEME OF EXAMINATION for B.Sc. / B.Sc. (Hons.) as per NEP-2020

Semester	Title of the Paper	Total No of Hours	Hours per week	Marks Theory/Practicals		Internal Assessment (IA)		Duration of Examination (Hours)	Total Marks	Credits
				Max	Min	Max	Min			
1st Semester	Phy-DSCT1: Mechanics and Properties of Matter	52	4	70	25	30	15	3	100	4
	Phy-DSCP1-Lab I	30	4	35	12	15	08	3	50	2
	Phy-OE1 : EnergySources OR Phy-OE2: Physics for All	39	3	70	25	30	15	3	100	3
2nd Semest	Phy-DSCT2: Electricity and Magnetism	52	4	70	25	30	15	3	100	4
	Phy-DSCP2-Lab II	30	4	35	12	15	08	3	50	2

er	**Phy-OE2:Atmospheric Science** OR **Phy-OE4: Sports Science**	39	3	70	25	30	15	3	100	3

Question Paper Patterns:

Note: *Choice of OE is left to the institution and the student. Here one subject is chosen as a place holder.

Model-I:** Pattern of question paper for semester end theory examinations (**ESE**)

Duration :2 hours   Max.Marks :70

Part -A

Multiple choice questions:

TENquestions to be answered .1 Mark for each question -------------------------1x10=10

Part -B

SIX questions to be answered out of EIGHT ---------------------------------------2x6 = 12

Part – C

Descriptive answers expected. FOURquestions to be answered out ofSIX4x8 = 32

Part -D

FOUR problems to be worked out from the SIX given. ----------------------------4x4 = 16

Total =70

Model-II**Question* paper pattern for semester end examinations for **Open Elective**subjects

Duration :2 hours   Max.Marks :60

<div align="center">Part -A</div>

1 Mark questions:

TENquestions to be answered out of 12 questions each of 1 Mark---10x1 =10

<div align="center">Part -B</div>

TENquestions to be answered out of TWELVE ------------------------------------10x2=20

<div align="center">Part – C (Problems only)</div>

Descriptive answers expected. THREEquestions to be answered out of SIX3x4 =12

<div align="center">Part -D</div>

Descriptive answers expectedTHREEquestions to be answered out of SIX --3x6 =18

Total = 60

Formative/Internal Assessment for Theory Papers**		
Assessment Occasion	Model I	Model II
Test-1 (Activity related)	15	20
Test-2 (Theory based)	15	20
Total Marks	30	40

Model-I: Thus, for a theory of 100 marks papers: 70 marks (ESE) + 30 (IA) = 100

Model-II: Thus, for a theory of 100 marks papers: 60 marks (ESE) + 40 (IA) = 100

Sl No	Distribution of Marks for the Practical Examination** (Phy-DSCP1 & Phy-DSCP2)		
	Particulars	Model-I	Model-II
1	Writing Principle/Statement/Formulae with symbols, units and explanations.	05	05
2	Drawing illustrative diagrams and expected graphs	03	**05**
3	Setting up of the experiment& taking readings	10	10
4	Calculations and graphs drawn based on experimental data.	05	05
5	Accuracy of results with units	02	**05**
6	Viva-Voce (Related to the experiment performed)	05	05
7	Valuation of Practical Record	05	05
	Total Marks	**35**	**40**

Note**: Two question models have been approved by the board to accommodate the old (CBCS) and new NEP patterns of internal assessments.

End of the Syllabus

BENGALURU NORTH UNIVERISTY

Syllabus for Bachelor of Science(Basic/Honors)
I & II Semester Mathematics Courses
Under- Graduate (UG) Program

Framed according to the National Education Policy
(NEP-2020)

DEPARTMENT OF MATHEMATICS
Bengaluru North University
Tamaka, Near NH 75 in Kolar
KARNATAKA

September – 2021

BENGALURU NORTH UNIVERSITY
Department of Mathematics

Date: 29-09-2021

PROCEEDING OF THE BOS (UG) MATHEMATICS

The meeting of the Board of Studies in UG Mathematics for the year 2021-22 was held on Wednesday, 29th September 2021 at 11.00am in the Department of Mathematics, GFGC, K R Puram, Bengaluru North University, Bengaluru. The following members attended the meeting:

1.	Dr. B. Chaluvaraju	Chairman	
2.	Prof. Madhulatha Moses	Member	
3.	Dr. Shivasharanappa Sigarkanti	Member	
4.	Prof. Nagaraddi B. Y.	Member	
5.	Prof. Mariya Khibthiya	Member	
6.	Prof. Kemparaju R.	Member	
7.	Dr. Abraham V. M	Member	
8.	Prof. C. Keshava Reddy	Member (Retired)	
9.	Prof. Thajmull Pasha	Member (Retired)	

Agenda and Resolution:

1. Final draft of the BNU-NEP-UG-Mathematics was checked and discussion held. The suggestions given by the BOS members and Senior Subject Experts Dr. Kemparaju S and Prof. Suguna H G, were incorporated.

2. The syllabus framed as per NEP-2020 and Karnataka State Higher Education Council guidelines. The syllabus prepared by teachers with a practical component (Mathematics practical with FOSS tools for programming). The BOS also resolved to change the list of practical experiments each year. Finally, the syllabus was approved by all the members.

3. The committee approved the updated panel examiners of UG (Mathematics).

The Chairman thanked the members for their cooperation.

[Dr. B. CHALUVARAJU] 29|09|21
CHAIRMAN
BNU-BOS in UG-Mathematics

Dr. B. CHALUVARAJU
M.Sc. Ph.D
Professor
Department of Mathematics
Bangalore University, Jnanabharathi
BENGALURU - 560 056.

Copy to:
1. The Registrar, Bengaluru North University, Bengaluru
2. The PS to the Vice-Chancellor, Bengaluru North University, Bengaluru

PREAMBLE

The subject wise expert committee to draft model curriculum contents in Mathematics constituted by the Department of Higher Education, Government of Karnataka, Bangalore vide GO No. ED 260 UNE 2019 (PART-1) DATED 13.08.2021 is pleased to submit its partial report on the syllabus for the First Year (First & Second Semesters) B.Sc. (Basic/Honors) Mathematics and detailed Course Structure for B.Sc. (Honors) Mathematics and M.Sc. (One Year) Mathematics.

The committee discussed various models suggested by the Karnataka State Higher Education Council in its joint meetings with the Chairpersons of Board of Studies of all state universities in Karnataka and resolved to adopt **Model IIA** (Model Program Structure for the Bachelor of Science (Basic/Hons.) for the subjects with practical's with Mathematics as Major/Minor.

To achieve the core objectives of the National Education Policy 2020 it is unanimously resolved to introduce computer based practical's for the Discipline Core (DSC) courses by using Free and Open Source Software's (FOSS) tools for implementation of theory based on DSC courses as it is also suggested by the LOCF committee that the papers may be taught using various Computer Algebra System (CAS) software's such as Mathematica, MATLAB, Maxima, Python and R to strengthen the conceptual understanding and widen up the horizon of students' self-experience. In view of these observations the subject expert committee suggested the software's Phython /R / Maxima/ Scilab/ Maple/MatLab/Mathematica for hands on experience of implementation of mathematical concepts in computer based lab.

The expert committee suggests the implementation this curriculum structure in all the Departments of Mathematics in Universities/Colleges in Karnataka. The subject expert committee designed the Course Learning Outcome (CO) to help the learners to understand the main objectives of studying the courses by keeping in mind of the Programme Outcomes (PO) of the graduate degree with honors in Mathematics or a graduate degree with Mathematics as a major subject.

As the Mathematics subject is a vast with several branches of specializations, it is difficult for every student to learn each branch of Mathematics, even though each paper has its own importance. Hence the subject expert committee suggests number of elective papers (for both Discipline electives and Open Electives) along with Discipline Core Courses. The BoS in Mathematics of universities may include additional electives based on the expertise of their staff and needs of the students'.

A student can select elective paper as per her/his needs and interest. The subject expert committee in Mathematics suggests that the concerned Department/Autonomous Colleges/Universities to encourage their faculty members to include necessary topics in addition to courses suggested by the expert committee.

MISSION AND VISION OF THE NEW SYLLABUS IN MATHEMATICS

Mission

- Improve retention of mathematical concepts in the student.
- To develop a spirit of inquiry in the student.
- To improve the perspective of students on mathematics as per modern requirement.
- To initiate students to enjoy mathematics, pose and solve meaningful problems, to use abstraction to perceive relationships and structure and to understand the basic structure of mathematics.
- To enable the teacher to demonstrate, explain and reinforce abstract mathematical ideas by using concrete objects, models, charts, graphs, pictures, posters with the help of FOSS tools on a computer.
- To make the learning process student-friendly by having a shift in focus in mathematical teaching, especially in the mathematical learning environment.
- Exploit techno-savvy nature in the student to overcome math-phobia.
- Propagate FOSS (Free and open source software) tools amongst students and teachers as per vision document of National Mission for Education.
- To set up a mathematics laboratory in every college in order to help students in the exploration of mathematical concepts through activities and experimentation.
- To orient students towards relating Mathematics to applications.

Vision

- To remedy Math phobia through authentic learning based on hands-on experience with computers.
- To foster experimental, problem-oriented and discovery learning of mathematics.
- To show that ICT can be a panacea for quality and efficient education when properly integrated and accepted.

- To prove that the activity-centered mathematics laboratory places the student in a problemsolving situation and then through self-exploration and discovery habituates the student into providing a solution to the problem based on his or her experience, needs, and interests.
- To provide greater scope for individual participation in the process of learning and becoming autonomous learners.
- To provide scope for greater involvement of both the mind and the hand which facilitates cognition?
- To ultimately see that the learning of mathematics becomes more alive, vibrant, relevant and meaningful; a program that paves the way to seek and understand the world around them. A possible by-product of such an exercise is that math-phobia can be gradually reduced amongst students.
- To help the student build interest and confidence in learning the subject.

Support system for Students and Teachers in understanding and learning FOSS TOOLS:

As a national level initiative towards learning FOSS tools, IIT Bombay for MHRD, Government of India is giving free training to teachers interested in learning open source software's like scilab, maxima, python, octave, geogebra and others.

(Website: http://spoken-tutorial.org ; email: contact@spoken-tutorial.org ; info@spokentutorial.org)

B.Sc. MATHEMATICS (BASIC/HONORS)

Programme Outcomes (PO)

By the end of the program the students will be able to:

PO1	**Disciplinary Knowledge**: Bachelor degree in Mathematics is the culmination of indepth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of pure and applied mathematics. This also leads to study the related are as such as computer science and other allied subjects.
PO2	**Communication Skills**: Ability to communicate various mathematical concepts effectively using examples and their geometrical visualization. The skills and knowledge gained in this program will lead to the proficiency in analytical reasoning which can be used form modeling and solving of real life problems.
PO3	**Critical thinking and analytical reasoning:** The students undergoing this programme acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real life problems.
PO4	**Problem Solving**: The Mathematical knowledge gained by the students through this programme develop an ability to analyze the problems, identify and define appropriate computing requirements for its solutions. This programme enhances students overall development and also equip them with mathematical modeling ability, problem solving skills.
PO5	**Research related skills:** The completing this programme develop the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics.
PO6	**Information/digital Literacy**: The completion of this programme will enable the learner to use appropriate softwares to solve system of algebraic Equation and differential equations.

PO7	**Self–directed learning**: The student completing this program will develop ability of working independently and to make an indepth study of various notions of Mathematics.
PO8	**Moral and ethical awareness/reasoning:** The student completing this program will develop an ability to identify unethical behavior such as fabrication, falsification or misinterpretation of data and adopting objectives, unbiased and truthful actions in all aspects of life in general and Mathematical studies in particular.
PO9	**Lifelong learning**: This programme provides self-directed learning and lifelong learnings kills. This programme helps the learner to think independently and develop algorithms and computational skills for solving real word problems.
PO10	Ability to per use advanced studies and research in pure and applied Mathematical sciences.

ASSESSMENT

WeightagefortheAssessments(inpercentage)

TypeofCourse	FormativeAssessment/ I.A.	SummativeAssessment(S.A.)
Theory	40%	60%
Practical	50%	50%
Projects	40%	60%
ExperientialLearning (Internshipetc.)	--	--

ContentsofB.Sc., (Basic/Honors)withMathematicsasMajorSubject (ModelIIA)

Semester	CourseNo.	Theory/Practical	Credits	PaperTitle	Marks S.A.	Marks I.A.
I	MATDSCT1.1	Theory	4	Algebra-IandCalculus-I	60	40
	MATDSCP1.1	Practical	2	TheorybasedPractical'sonAlgebra-IandCalculus–I	25	25
	MATOET1.1	Theory	3	(A) Mathematics–I (B) BusinessMathematics–I	60	40
II	MATDSCT2.1	Theory	4	Algebra-IIandCalculus-II	60	40
	MATDSCP2.1	Practical	2	TheorybasedPractical'sonAlgebra-IIandCalculus-II	25	25
	MATOET2.1	Theory	3	(A) Mathematics–II (B) BusinessMathematics-II	60	40
		ExitOptionwithCertificate				
III	MATDSCT3.1	Theory	4	OrdinaryDifferentialEquationsand RealAnalysis-I	60	40
	MATDSCP3.1	Practical	2	TheorybasedPractical'sonOrdinaryDifferentialEquationsandReal Analysis-I	60	40
	MATOET3.1	Theory	3	(A) OrdinaryDifferentialEqua tions (B) QuantitativeMathematics	60	40
IV	MATDSCT4.1	Theory	4	PartialDifferentialEquationsand IntegralTransforms	60	40
	MATDSCP4.1	Practical	2	TheorybasedPractical'sonPartial DifferentialEquationsandIntegralTra nsforms	25	25
	MATOET4.1	Theory	3	(A) PartialDifferentialEquations (B) MathematicalFinance	60	40
		ExitOptionwithDiploma				
V	MATDSCT5.1	Theory	3	RealAnalysisandComplexAnalysis	60	40
	MATDSCP5.1	Practical	2	TheorybasedPractical'sonReal AnalysisandComplexAnalysis	25	25
	MATDSCT5.2	Theory	3	RingTheory	60	40
	MATDSCP5.2	Practical	2	TheorybasedPractical'sonRing Theory	25	25
	MATDSET5.1	Theory	3	(A) VectorCalculus (B) Mechanics (C) MathematicalLogic	60	40
	MATDSCT6.1	Theory	3	LinearAlgebra	60	40
VI	MATDSCP6.1	Practical	2	TheorybasedPractical'sonLinear Algebra	25	25

	MATDSCT6.2	Theory	3	NumericalAnalysis	60	40
	MATDSCP6.2	Practical	2	TheorybasedPractical'son NumericalAnalysis	25	25
	MATDSET6.1	Theory	3	(A) AnalyticalGeometryin3D (B) NumberTheory (C) SpecialFunctions (D) HistoryofBhârtîyaGaṇita	60	40

<div align="center" style="color:red">ExitOptionwithBachelorofScience(B.Sc.,) Basic Degree</div>

	MATDSCT7.1	Theory	3	DiscreteMathematics	60	40
VII	MATDSCP7.1	Practical	2	TheorybasedPractical'sonDiscrete Mathematics	25	25
	MATDSCT7.2	Theory	3	AdvancedOrdinaryDifferential Equations	60	40
	MATDSCP7.2	Practical	2	Theory based Practical's onAdvancedOrdinaryDifferenti al Equations	25	25
	MATDSCT7.3	Theory	4	AdvancedAnalysis	60	40
	MATDSET7.1	Theory	3	(A) GraphTheory (B) EntireandMeromorphicF unctions (C) GeneralTopology (D) BhâratîyaTrikoṇmitiŚâstra	60	40
	MATDSET7.2	Theory	3	ResearchMethodologyin Mathematics	60	40
VIII	MATDSCT8.1	Theory	4	AdvancedComplexAnalysis	60	40
	MATDSCT8.2	Theory	4	AdvancedPartialDifferential Equations	60 60	40 40
	MATDSCT8.3	Theory	3	FuzzySetsandFuzzySystems	60	40
	MATDSET8.1	Theory	3	(A) OperationsResearch (B) LatticetheoryandBooleanAl gebra (C) MathematicalModelling (D) Aṅkapâśa(Combinatorics)	60	40
	MATDSET8.2	ResearchProject	6(3+3)	ResearchProject* OR AnyTwoofthefollowingelectives (A) FiniteElementMethods (B) Cryptography (C) InformationTheoryandCoding (D) GraphTheoryandNetworking	120 OR 60 60	80 OR 40 40

<div align="center" style="color:red">AwardofBachelorofScience (B.Sc.,)HonorsDegreeinMathematics</div>

CURRICULUM STRUCTUREFORUNDERGRADUATE DEGREE PROGRAM

NameoftheDegreeProgram : **B.Sc.,(Basic/Honors)**
Discipline/Subject : **Mathematics**
StartingYearofImplementation : **2021-22**

PROGRAMARTICULATIONMATRIX

Semester	CourseNo.	ProgrammeOutcomes thatthe CourseAddresses	Pre-RequisiteCourse(s)	Pedagogy*	Assessment**
I	MATDSCT1.1	PO1,PO2,PO3	-----	MOOC	CLASSTESTS
II	MATDSCT2.1	PO1,PO2,PO3, PO8	MATDSCT1.1	PROBLEM SOLVING	
III	MATDSCT3.1	PO1,PO4,PO7, PO8	-----	SEMINAR	SEMINAR QUIZ
IV	MATDSCT4.1	PO1,PO4,PO7, PO8	MATDSCT3.1	PROJECT BASED	
V	MATDSCT5.1	PO1,PO2,PO3, PO5	----	LEARNING	ASSIGNMENT
V	MATDSCT5.2	PO 3, PO 4, PO 7,PO10	MATDSCT2.1	ASSIGNMENTS	
VI	MATDSCT6.1	PO6, PO 7, PO10	MATDSCT5.2	GROUPDISCUSSION	
VI	MATDSCT6.2	PO3,PO 4,PO5, PO 8, PO 9, PO10	MATDSCT1.1 & MATDSCT2.1		
VII	MATDSCT7.1	PO3,PO4,PO5, PO7,PO9.	MATDSCT1.1 & MATDSCT2.1		TERM ENDEXAM
VII	MATDSCT7.2	PO2,PO 4,PO5, PO10	MATDSCT3.1		
VII	MATDSCT7.3	PO2,PO 4,PO5, PO10	MATDSCT3.1		
VIII	MATDSCT8.1	PO2,PO4,PO5, PO10	MATDSCT5.1		
VIII	MATDSCT8.2	PO2,PO 4,PO5, PO10	MATDSCT4.1		VIVA-VOCE
VIII	MATDSCT8.3	PO2,PO4,PO5, PO10	MATDSCT7.3		

**Pedagogy for student engagement is predominantly Lecture. However, other pedagogies enhancing better student engagement to be recommended for each course. This list includes active learning/course projects / Problem based or Project based Learning / Case Studies /Self Study likeSeminar, Term Paper or MOOC.

***Every Course needs to include assessment for higher order thinking skills (Applying/ Evaluating/Creating). However, this column may contain alternate assessment methods that help formative assessment(i.e. assessment for Learning).

B.Sc., (Basic/Honors) with Mathematics as a Minor in the 3rd Year

Semester	Course No.	Theory/Practical	Credits	Paper Title	Marks S.A.	Marks I.A.
V	MATDSCMT5.1	Theory	3	Complex Analysis	60	40
	MATDSCMP5.1	Practical	2	Theory based Practical's on Complex Analysis	25	25
VI	MATDSCMT6.1	Theory	3	Numerical Analysis	60	40
	MATDSCMP6.1	Practical	2	Theory based Practical's on Numerical Analysis	25	25

Abbreviation for MATDSCMT5.1/MATDSCMP5.1: MAT–Mathematics; **DSC**–Discipline Core; **M**–Minor; **T**–Theory/**P**–Practical; **5**–Fifth Semester; **.1**–Course 1

Credit Distribution for B.Sc., (Basic/Honors) with Mathematics as Major in the 3rd Year (For Model IIA)

Subject	Semester	Major/Minor in the 3rd Year	Credits: Discipline Specific Core (DSC)	Open Elective (OE)	Discipline Specific Elective (DSE)	AECC & Languages	Skill Enhancement Courses (SEC)	Total Credits
Mathematics	I-IV	Major	4 Courses (4+2)x4=24	4 Courses 3x4 =12	---	(4+4=8) Courses 8x(3+1)=32	2 Courses 2x(1+1)=4	72
Other Subject		Minor	24	--	--	--	--	24
96								
Mathematics	V&VI	Major	4 Courses 4x(3+2)=20	-----	2 Courses 2x3= 06	---	2 Courses 2x2=4	30
Other Subject		Minor	10	--	--	--	--	10
(96+40)=136								
Mathematics	VII& VIII	Major	2 Courses 2x (3+2)=10 3 Courses 3x 4=12 1 Course 1x3=3 Total=25	-----	2 Courses 2x3=6 Res.Meth 1x3=3 2 Courses 2x3=6 Total=15	----	-----	40
Total No. of Courses			14	04	07	08	04	
136+40=**176**								

11

Syllabus for B.Sc., (Basic/ Honors) with Mathematics as
Major & Minor Subject

SEMESTER – I

MATDSCT 1.1: Algebra - I and Calculus - I	
Teaching Hours: 4 Hours/Week	**Credits: 4**
Total Teaching Hours: 56 Hours	**Max. Marks: 100** **(S.A.-60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to
- Learn to solve system of linear equations.
- Solve the system of homogeneous and non-homogeneous linear of m equations in n variables by using concept of rank of matrix, finding eigen values and eigenvectors.
- Sketch curves in Cartesian, polar and pedal equations.
- Students will be familiar with the techniques of integration and differentiation of function with real variables.
- Identify and apply the intermediate value theorems and L'Hospital rule.

Unit-I: Matrix
Elementary row and column transformations (operations). Equivalent matrices, theorems on it. Row-reduced echelon form of a matrix. Rank of matrix, Problems.
Homogeneous and non-homogeneous system of m linear equations in n unknowns consistency criterion-criterion for uniqueness of solutions.
Eigen values and Eigen vectors of square matrix of order 2 and 3 standard properties, Matrix polynomial, Cayley-Hamilton theorem (with proof). Find A^{-1}, A^{-2} and A^2, A^3, A^4.

14 Hours

Unit-II: Differential Calculus-I
Limits, Continuity, Differentiability and properties. Properties of continuous functions. Intermediate value theorem, Rolle's Theorem, Lagrange's Mean Value theorem, Cauchy's Mean value theorem and examples. Taylor's theorem, Maclaurin's series (without proof), Indeterminate forms and evaluation of limits using L'Hospital rule.

14 Hours

Unit-III: Polar Co-ordinates
Polar coordinates, angle between the radius vector and tangent. Angle of intersection of two curves (polar forms), length of perpendicular from pole to the tangent, pedal equations. Derivative of an arc in Cartesian, parametric and polar forms, curvature of plane curve-

radius of curvature formula in Cartesian, parametric, polar, and pedal forms- center of curvatureand asymptotes.

14 Hours

Unit-IV:Successive Differentiation

n^{th} Derivatives of Standard functions $e^{ax+b}, (ax+b)^n, \log(ax+b), \sin(ax+b), \cos(ax+b)$, $e^{ax}\sin(bx+c), e^{ax}\cos(bx+c)$,Leibnitz theorem and its applications.

Extended polar co-ordinates-Singular and Multiple points.Tracing of curves (standard curves).

14 Hours

Reference Books:
1. University Algebra - N.S. Gopala Krishnan, New Age International (P) Limited, 1986.
2. Theory of Matrices - B S Vatsa, New Age International Publishers, 2005.
3. Matrices - A R Vasista, Krishna Prakashana Mandir, 2003.
4. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi, 2005.
5. Applications of Calculus, Debasish Sengupta, Books and Allied (P) Ltd., 2019.
6. Calculus – Lipman Bers, Holt, Rinehart & Winston, 1969.
7. Calculus - S Narayanan & T. K. Manicavachogam Pillay, S. Viswanathan Pvt. Ltd., vol. I & II, 1996.
8. Schaum's Outline of Calculus - Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
9. Text Book of B.Sc. Mathematics, G K Ranganath, S Chand & Company, 2018
10. Text Book of B.Sc . Mathematics G B Gururajachar, Academic Excellence series, 2019

Web Resources:
1. http://www.nptelvideos.in/2012/11/mathematics.html
2. https://www.my-mooc.com/en/categorie/mathematics
3. http://ocw.mit.edu/courses/mathematics/

MATDSCP 1.1: Practical's on Algebra - I and Calculus – I	
Practical Hours : 4 Hours/Week	**Credits: 2**
Total Practical Hours: 56 Hours	**Max. Marks: 50** **(S.A.-25 + I.A. – 25)**

Course Learning Outcomes: This course will enable the students to
- Learn Free and Open Source Software (FOSS) tools for computer programming
- Solve problem on algebra and calculus theory studied in MATDSCT 1.1 by using FOSS software's.
- Acquire knowledge of applications of algebra and calculus through FOSS.

Practical/Lab Work to be performed in Computer Lab (FOSS)

Suggested Software's: Maxima/Python

1. Introduction to Python/Maxima.
2. Commands in Python/ Maxima.
3. Simple programs in Python/ Maxima
4. Matrices –Algebra of matrices.
5. Computation of rank of matrix.
6. Solving the system of homogeneous and non-homogeneous linear algebraic equations.
7. Computation of inverse of matrix using Cayley-Hamilton theorems.
8. Finding the angle between the radius vector and tangent and angle between two curves.
9. Finding the radius of curvature of the given curve.
10. Verification of mean value theorems.
11. Find the Taylor's and Maclaurin's expansion of the given function.
12. Indeterminate forms and evaluation of limits using L-Hospital Rule.
13. Finding the nth derivative.
14. Tracing of standard curves.

OPEN ELECTIVE COURSE

(For students of Science stream who have not chosen Mathematics as one of Core subjects)

MATOET 1.1: Mathematics - I	
Teaching Hours : 3 Hours/Week	**Credits: 3**
Total Teaching Hours: 42 Hours	**Max. Marks: 100** **(S.A.-60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to
- Learn to solve system of linear equations.
- Solve the system of homogeneous and non- homogeneous *m* linear equations by usingthe concept of rank of matrix, finding eigen values and eigen vectors.
- Students will be familiar with the techniques of differentiation of function with real variables.
- Identify and apply the intermediate value theorems and L'Hospital rule.
- Learn to trace some standard curves.

Unit-I: Matrix

Elementary row and column transformations (operations). Equivalent matrices, theorems on it. Row-reduced echelon form of a matrix. Rank of matrix, Problems.

Homogeneous and non-homogeneous system of m linear equations in n unknowns consistency criterion-criterion for uniqueness of solutions.

Eigen values and Eigen vectors of square matrix of order 2 and 3 standard properties, Matrix polynomial, Cayley-Hamilton theorem, (with proof). Find A^{-1}, A^{-2} and A^2, A^3, A^4.

14 Hours

Unit-II: Differential Calculus-I

Limits, Continuity, Differentiability and properties. Properties of continuous functions. Intermediate value theorem, Rolle's Theorem, Lagrange's Mean Value theorem, Cauchy's Mean value theorem and examples. Taylor's theorem, Maclaurin's series (without proof), Indeterminate forms and evaluation of limits using L'Hospital rule.

14 Hours

Unit-III:Differential Calculus-II

Successive Differentiation-n^{th} Derivatives of Standard functionse^{ax+b}, $(ax+b)^n$, $\log(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $e^{ax}\sin(bx+c)$, $e^{ax}\cos(bx+c)$,Leibnitz theorem and its applications.

14 Hours

Reference Books:

1. University Algebra - N.S. Gopala Krishnan, New Age International (P) Limited, 1986.
2. Theory of Matrices - B S Vatsa, New Age International Publishers, 2005.
3. Matrices - A R Vasista, Krishna Prakashana Mandir, 2003.
4. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi, 2005.
5. Applications of Calculus, Debasish Sengupta, Books and Allied (P) Ltd., 2019.
6. Calculus – Lipman Bers, Holt, Rinehart & Winston, 1969.
7. Calculus - S Narayanan & T. K. Manicavachogam Pillay, S. Viswanathan Pvt. Ltd., Vol. I & II, 1996.
8. Schaum's Outline of Calculus - Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
9. Text Book of B.Sc . Mathematics G B Gururajachar, Academic Excellence series, 2019

Web Resources:

1. http://www.nptelvideos.in/2012/11/mathematics.html
2. https://www.my-mooc.com/en/categorie/mathematics
3. http://ocw.mit.edu/courses/mathematics/

(For Students of other than Science Stream)

MATOE 1.1(B): Business Mathematics-I	
Teaching Hours: 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A. – 40)

Course Learning Outcomes: This course will enable the students to
- Translate the real word problems through appropriate mathematical modeling.
- Explain the concepts and use equations, formulae and mathematical expression and relationship in a variety of context.
- Finding the extreme values of functions.
- Analyze and demonstrate the mathematical skill require in mathematically intensive areas in economics and business.

Unit-I: Algebra
Set theory and simple applications of Venn Diagram, relations, functions, indices, logarithms, permutations and combinations. Examples on commercial mathematics.

14 Hours

Unit - II: Matrices
Definition of a matrix, types of matrices, algebra of matrices. Properties of determinants; calculations of values of determinants upto third order, Adjoint of a matrix, elementary row and column operations, solution of a system of linear equations having unique solution and involving not more than three variables. Examples on commercial mathematics.

14 Hours

Unit - III: Percentage, Ratios and Proportions
Percentages: Definition, Calculation of percentage, Ratios- Types of Ratios, Duplicate, Triplicate and Sub-Duplicate of ratio, Proportions - Definitions and properties- cross product property and Reciprocal property, United proportions – Continued proportions – Compound proportions, Examples on commercial mathematics.

14 Hours

Reference Books:
1. Basic Mathematics, Allel R.G.A, Macmillan, New Delhi, 1938.
2. Mathematics for Economics, Dowling, E.T. , Schaum's Series, McGraw Hill, London, 1992.
3. Quantitative Techniques in Management, Vohra, N.D., Tata McGraw Hill, NewDelhi, 1990.

4. Business Mathematics, Soni R.S., Pitamber Publishing House, Delhi, 1996.

Web Resources:
   1. http://www.nptelvideos.in/2012/11/mathematics.html
   2. https://www.my-mooc.com/en/categorie/mathematics
   3. http://ocw.mit.edu/courses/mathematics/

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SEMESTER – II

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MATDSCT 2.1: Algebra - II and Calculus - II	
Teaching Hours : 4 Hours/Week	**Credits: 4**
Total Teaching Hours: 56 Hours	**Max. Marks: 100** **(S.A.-60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to
   • Recognize the mathematical objects called Groups.
   • Link the fundamental concepts of groups and symmetries of geometrical objects.
   • Explain the significance of the notions of Cosets, subgroups and cyclic groups
   • Understand the concept of differentiation and fundamental theorems in differentiationand various rules.
   • Find the extreme values of functions of two variables.
   • Understand the concept of integral calculus and their significance.

Unit-I: Groups
Definition of a group with examples and properties. Subgroups, center of groups, order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Factor groups, Lagrange's theorem and its consequences. Fundamental of Congruence, Fermat's theorem and Euler's ϕ function.

14 hours

Unit-II: Partial Derivatives
Functions of two or more variables-explicit and implicit functions, partial derivatives. Homogeneous functions- Euler's theorem, total derivatives, differentiation of implicit and composite functions, Jacobians and standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables.

14 hours

Unit-III: Integral Calculus-I

Reduction formulae for $\int \sin^n x\, dx$, $\int \cos^n x\, dx$, $\int \tan^n x\, dx$, $\int \cot^n x\, dx$, $\int \sec^n x\, dx$, $\int \csc^n x\, dx$, $\int \sin^m x \cos^n x\, dx$ with define limit –Problems. Application of integral Calculus: Computation of length of arc, plane area and surface area and volume of solids of revolutions for standard curves in Cartesian and polar forms.

14 hours

Unit-IV: Integral Calculus-II

Line integral: Definition of line integral and basic properties, examples on evaluation of lineintegrals. Double integral: Definition of Double integrals and basic properties, examples on evaluation of double integrals. Triple Integrals: Definition of triple integrals and basic properties, examples on evaluation of triple integral.

14 hours

Reference Books:
1. Topics in Algebra, I N Herstein, Wiley Eastern Ltd., New Delhi, 1991.
2. Higher algebra, Bernard & Child, Arihant, 1959.
3. Modern Algebra, Sharma and Vasista, Krishna Prakashan Mandir, Meerut, U.P., 2013.
4. Differential Calculus, Shanti Narayan, S. Chand & Company, New Delhi, 1962.
5. Integral Calculus, Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd., 2013.
6. Schaum's Outline Series, Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
7. A Course in Abstract Algebra, Vijay K Khanna and S K Bhambri, VikasPublications.
8. Text Book of B.Sc. Mathematics, G K Ranganath, S Chand & Company, 2018
9. Text Book of B.Sc . Mathematics G B Gururajachar, Academic Excellence series, 2019

Web Resources:
1. http://www.nptelvideos.in/2012/11/mathematics.html
2. https://www.my-mooc.com/en/categorie/mathematics
3. http://ocw.mit.edu/courses/mathematics/

PRACTICAL

MATDSCP 2.1: On Algebra -II and Calculus – II	
Practical Hours : 4 Hours/Week	**Credits: 2**
Total Practical Hours: 56 Hours	**Max. Marks: 50** **(S.A.-25 + I.A. – 25)**

Course Learning Outcomes: This course will enable the students to
- Learn Free and Open Source Software (FOSS) tools for computer programming
- Solve problem on algebra and calculus by using FOSS software's.
- Acquire knowledge of applications of algebra and calculus through FOSS

Practical/Lab Work to be performed in Computer Lab

Suggested Software's: Maxima/Phython.

1. Program to construct Cayley's table and test abelian for given finite set.
2. Program to find all possible cosets of the given finite group.
3. Program to find generators and corresponding possible subgroups of a cyclic group.
4. Programs to verification of Lagrange's theorem with suitable examples.
5. Program to verify the Euler's ϕ function for a given finite group.
6. Program to verify the Euler's theorem and its extension.
7. Program to find Jacobian.
8. Programs to construct series using Maclaurin's expansion for functions of two variables.
9. Program to verify the given Reduction formula with or without limits.
10. Program to evaluate the Surface area, volume of solid of revolutions for standard curves
11. Program to evaluate the line integrals with constant and variable limits.
12. Program to evaluate the Double integrals with constant and variable limits.
13. Program to evaluate the Triple integrals with constant and variable limits.

OPEN ELECTIVE COURSE
(For students of Science stream who have not chosen Mathematics as one of the Core subjects)

MATOET 2.1(A): Mathematics – II	
Teaching Hours : 3 Hours/Week	**Credits: 3**
Total Teaching Hours: 42 Hours	**Max. Marks: 100** **(S.A.- 60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to
*   Recognize the mathematical objects called Groups.
*   Link the fundamental concepts of groups and symmetries of geometrical objects.
*   Explain the significance of the notions of cosets, subgroups and cyclic groups.
*   Understand the concept of differentiation and fundamental theorems in differentiation and various rules.
*   Find the extreme values of functions of two variables.
*   To understand the concepts of integral calculus and their significance.

Unit-I: Groups

Definition of a group with examples and properties. Subgroups, center of groups, order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Lagrange's theorem and its consequences. Fundamental of Congruence, Fermat's theorem and Euler's ϕ function.

14 hours

Unit-II: Partial Derivatives

Functions of two or more variables-explicit and implicit functions, partial derivatives. Homogeneous functions- Euler's theorem, total derivatives, differentiation of implicit and composite functions, Jacobians and standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables.

14 hours

Unit-III: Integral Calculus-I

Reduction formulae for $\int \sin^n x \, dx$, $\int \cos^n x \, dx$, $\int \tan^n x \, dx$, $\int \cot^n x \, dx$, $\int \sec^n x \, dx$, $\int \csc^n x \, dx$, $\int \sin^m x \cos^n x \, dx$ with define limit –Problems. Application of integral Calculus:Computation of length of arc, plane area and surface area and volume of solids of revolutions for standard curves in Cartesian and polar forms.

14 hours

Reference Books:

1. Topics in Algebra, I N Herstein, 2nd Edition, Wiley Eastern Ltd., New Delhi, 1975.
2. Higher algebra, Bernard & Child, Arihant Pub, 1959.
3. Modern Algebra, Sharma and Vasishta, Krishna Prakashan Mandir, Meerut, U.P, 2013.
4. A Course in Abstract Algebra, Vijay K Khanna and S K Bhambri, Vikas Publications, 1998.
5. Differential Calculus, Shanti Narayan, S. Chand & Company, New Delhi, 1962.
6. Integral Calculus, Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd., 2013.
7. Schaum's Outline Series, Frank Ayres and Elliott Mendelson, 5th ed. USA:McGraw Hill., 2008.
8. Text Book of B.Sc. Mathematics, G K Ranganath,S Chand & Company, 2018
9. Text Book of B.Sc . Mathematics G B Gururajachar, Academic Excellence series, 2019

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2. https://www.my-mooc.com/en/categorie/mathematics
3. http://ocw.mit.edu/courses/mathematics/

OPEN ELECTIVE COURSE
(For Students of other than science stream)

MATOET 2.1(B): Business Mathematics-II	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A. – 40)

Course Learning Outcomes: This course will enable the students to
- Integrate concept in international business concept with functioning of global trade.
- Evaluate the legal, social and economic environment of business.
- Apply decision-support tools to business decision making.
- Will be able to apply knowledge of business concepts and functions in an integrated manner.

Unit - I: Mathematical logic
Propositions, Truth values, Logical connectives, Truth table, Tautology and Contradiction, Logical equivalence, Negations, Converse, Inverse and Contrapositive of condition proposition and examples on commercial mathematics.

14 hours

Unit - II: Commercial Arithmetic
Interest: Concept of Present value and Future value, Simple interest, Compound interest, Nominal and Effective rate of interest, Examples and Problems Annuity: Ordinary Annuity, Sinking Fund, Annuity due, Present Value and Future Value of Annuity, Equated Monthly Installments (EMI) by Interest of Reducing Balance and Flat Interest methods, Examples and Problems.

14 Hours

Unit - III: Measures of central Tendency and Dispersion
Frequency distribution: Raw data, attributes and variables, Classification of data, frequency distribution, cumulative frequency distribution, Histogram and give curves. Requisites of ideal measures of central tendency, Arithmetic Mean, Median and Mode for ungrouped and grouped data. Combined mean, Merits and demerits of measures of central tendency, Geometric mean: definition, merits and demerits, Harmonic mean: definition, merits and demerits, Choice of A.M., G.M. and H.M. Concept of dispersion, Measures of dispersion: Range, Variance, Standard deviation (SD) for grouped and ungrouped data, combined SD, Measures of relative dispersion: Coefficient of range, coefficient of variation. Examples and problems.

14 Hours

Reference Books:
1. Mathematics for Commerce, K. Selvakumar Notion Press Chennai, 2014.
2. Business Mathematics with Applications, Dinesh Khattar & S. R. Arora S. Chand Publishing New Delhi, 2001.
3. Business Mathematics and Statistics, N.G. Das &Dr. J.K. Das McGraw Hill New Delhi, 2017.
4. Fundamentals of Business Mathematics, M. K. Bhowal, Asian Books Pvt. Ltd New Delhi, 2009.
5. Mathematics for Economics and Finance: Methods and Modelling, Martin Anthony and Norman, Biggs Cambridge University Press Cambridge, 1996.
6. Financial Mathematics and its Applications, Ahmad Nazri Wahidudin Ventus Publishing APS Denmark, 2011.
7. Fundamentals of Mathematical Statistics, Gupta S. C. and Kapoor V. K.:, Sultan Chand and Sons, New Delhi, 2002.
8. Statistical Methods, Gupta S. P.: Sultan Chand and Sons, New Delhi, 2014.
9. Applied Statistics, Mukhopadhya,Primal New Central Book Agency Pvt. Ltd. Calcutta, 1999.
10. Practical Business Mathematics, S. A. Bari New Literature Publishing Company New Delhi.
11. Fundamentals of Statistics, Goon A. M., Gupta, M. K. and Dasgupta, B. World Press Calcutta, 2016.
12. Fundamentals of Applied Statistics, Gupta S. C. and Kapoor V. K.:, Sultan Chand and Sons, New Delhi, 2014.

Web Resources:
1. http://www.nptelvideos.in/2012/11/mathematics.html
2. https://www.my-mooc.com/en/categorie/mathematics
3. http://ocw.mit.edu/courses/mathematics/