विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरणा नुसार पदवी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

परिपत्रक

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत Computer Science & Computer Application अभ्यासमंडळाने दिनांक ०५ ऑक्टोबर २०२४ रोजीच्या बैठकीत BCA आणि B. Sc. Artifical Intelligence and Machine Learning या कोर्सेसचा अभ्यासक्रम शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत शिफारस केल्यानुसार तसेच मा. अधिष्ठाता मंडळाच्या दिनांक ०८ नोव्हेंबर २०२४ रोजीच्या बैठकीतील ऐनवेळचा विषय क्रमांक ३/६७–२०२४ च्या ठरावातील केलेल्या शिफारसी नुसार अभ्यासक्रम लागू करण्याच्या दृष्टीने मा. कुलगुरू महोदयांनी विद्यापरिषदेच्या मान्यतेच्या अधीन राहून मान्यता प्रदान केली आहे. त्यानुसार राष्ट्रीय शैक्षणिक धोरणानुसार खालील अभ्यासक्रम शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्यात येत आहेत.

1. B. Sc. I year Artufucak Intelligence and Machine Learning (AI& ML)
2. BCA I year (Bachelor in Computer Application)

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या www.srtmun.ac.in या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१ /एनइपी/युजीप्रथमवर्षअभ्यासक्रम/ २०२४–२५/**३१७**
दिनांक २८.११.२०२४

डॉ. सरिता लोसरवार
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : १) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) मा. संचालक, सर्व संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
५) मा. प्राचार्य, न्यू मॉडल डिग्री कॉलेज हिंगोली.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606 (MS)

स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड

(**Credit Framework and Structure of Four Year UG Program with Multiple Entry and Exit Option as per NEP-2020**)

UNDERGRADUATE PROGRAM OF
SCIENCE & TECHNOLOGY UNDER THE BoS OF COMPUTER SCIENCE AND APPLICATION

BCA (Single Major)

(Bachelor in Computer Application)
(Honours and Honours with Research)

Under the Faculty of Science & Technology

(Revised as per the Govt. Of Maharashtra circular Dt. 13-03-2024)

&

(Based on the AICTE model curriculum suggested in Sept 2024)

From the Desk of the Dean, Faculty of Science and Technology

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement "***Enlightened Student: A Source of Immense Power***", is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the University to achieve ***the 3Es, the equity, the efficiency*** and ***the excellence*** in higher education of this region. To overcome the difficulty of comparing the performances of the graduating students and also to provide mobility to them to join other institutions the University has adopted the cumulative grade point average (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better employ ability, entrepreneurship possibilities and to enhance the latent skills of the stakeholders the University has adopted the Choice Based Credit System (CBCS) in the year 2018-2019 at graduate and post-graduate level. This provided flexibility to the students to choose courses of their own interests. To encourage the students to opt the world-class courses offered on the online platforms like, NPTEL, SWAYM, and other MOOCS platforms the University has implemented the credit transfer policy approved by its Academic Council and also has made a provision of reimbursing registration fees of the successful students completing such courses.

SRTM University has been producing a good number of high calibre graduates; however, it is necessary to ensure that our aspiring students are able to pursue the right education. Like the engineering students, the youngsters pursuing science education need to be equipped and trained as per the requirements of the R&D institutes and industries. This would become possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Higher education is a dynamic process and in the present era the stakeholders need to be educated and trained in view of the self-employment and self-sustaining skills like start-ups. Revision of the curriculum alone is not the measure for bringing reforms in the higher education, but invite several other initiatives. Establishing industry-institute linkages and initiating internship, on job training for the graduates in reputed industries are some of the important steps that the University would like to take in the coming time. As a result, revision of the curriculum was the need of the hour and such an opportunity was provided by the New Education Policy 2020. National Education Policy 2020 (NEP 2020) aims at equipping students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. As a result the

students will acquire expertise in specialized areas of interest, kindle their intellectual curiosity and scientific temper, and create imaginative individuals.

The curriculum given in this document has been developed following the guidelines of NEP-2020 and is crucial as well as challenging due to the reason that it is a transition from general science based to the discipline-specific-based curriculum. All the recommendations of the Sukanu Samiti given in the NEP Curriculum Framework-2023 have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. All the Board of Studies (BoS) under the Faculty of Science and Technology of this university have put in their tremendous efforts in making this curriculum of international standard. They have taken care of maintaining logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding of the students.

We take this opportunity to congratulate the Chairman(s) and all the members of various Boards of Studies for their immense contributions in preparing the revised curriculum for the benefits of the stakeholders in line with the guidelines of the Government of Maharashtra regarding NEP-2020. We also acknowledge the suggestions and contributions of the academic and industry experts of various disciplines.

We are sure that the adoption of the revised curriculum will be advantageous for the students to enhance their skills and employ ability. Introduction of the mandatory On Job Training, Internship program for science background students is praise worthy and certainly help the students to imbibe first hand work experience, team work management. These initiatives will also help the students to inculcate the workmanship spirit and explore the possibilities of setting up of their own enterprises.

Dr. M. K. Patil

Dean

Faculty of Science and Technology

Program Specific Outcomes:

PSO 01: Students will be able to understand analyses and develop computer programs in the areas related to algorithm, system software, web design and networking for efficient design of computer-based system.

PSO 02: Apply standard software engineering practices and strategies in software project development using open-source programming environment to deliver a quality of product for business success.

PSO 03: Student will be able to know various issues, latest trends in technology development in the field of AI and thereby, innovate new ideas and solutions to existing problems.

PSO 04: Explore technical knowledge in diverse areas of computer applications and experience an environment conducive in cultivating skills for successful career, entrepreneurship and higher studies.

GENERAL COURSE STRUCTURE & THEME

A.   Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hrs. Practical (P) per week	1 Credit

B. Course Code and definition:

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
DSC (CT/CP)	Core Courses
AEC	Ability Enhancement Courses
MDE	Multi-Disciplinary Elective course
VEC	Value added Courses
SEC (ST/SP)	Skill Enhancement courses
DSE (ET/EP)	Discipline Specific Elective
GE/OE	Open Elective
OJT	On Job Training (Internship/ Apprenticeship)
FP	Field Project
CEP	Community Engagement and Service
CC	Co-Curricular Courses
RM	Research Methodology
RP	Research Project /Dissertation

Course Level/Duration/System:

A. Eligibility for Admission: As per the regulations of the SRTMUN, AICTE/DTE and Government of Maharashtra, issued from Time-to-time regarding admission process.

B. As per NEP-2020 policy, it is a UG program (3/4 years) (6/ 8 Semesters) with multiple entry and exit. The following option will be made available to the students joining BCA Research Program:

    1. One year: Under Graduate Certificate in Computer Application

    2. Two years: Under Graduate Diploma in Computer Application

    3. Three years: Bachelor in Computer Application (BCA)

    4. Four years: Bachelor in Computer Application with Honours: BCA (Honours) or Bachelor in Computer Application Honours with Research: BCA (Honours with Research)

Note: The students who are eligible for BCA (Honours with Research) shall have choice to pursue either BCA (Honours) or BCA (Honours with Research).

SEMESTER WISE CREDIT DISTRIBUTION: Semester wise credit distribution of proposed BCA [BCA (Honours) and BCA (Honours with research)] program:

Semester	Core Courses	Ability Enhancement Courses (AEC)	Multi-Disciplinary Elective Course (MDE)	Value Added Courses (VEC)	Skill Enhancement courses (SEC)	Discipline Specific Elective (DSE)	Total
I	8	2	2	2	5	-	19
II	12	-	-	2	7	-	21
Higher Semester -Tentative Structure yet to be defined**							
III	-	-	-	-	-	-	19/20
IV	-	-	-	-	-	-	20/21
V	-	-	-	-	-	-	19/20
VI	-	-	-	-	-	-	20/21
BCA (Honours) Tentative Structure yet to be defined**							
VII	-	-	-	-	-	-	19/20
VIII	-	-	-	-	-	-	20/21
BCA (Honours with Research) Tentative Structure yet to be defined**							
VII	-	-	-	-	-	-	19/20
VIII	-	-	-	-	-	-	20/21

Category-wise distribution to be followed as per AICTE norms. *

Description	Core Courses (DSC)	Ability Enhancement Courses (AEC)	Multi-Disciplinary Elective course (MDE)	Value Added Courses (VEC)	Skill Enhancement Courses (SEC)	Discipline Specific Elective (DSE)	Total Credits
BCA	50	3	2	6	28	31	120
BCA (Honours)	55	3	5	6	40	51	160
BCA (Honours with Research)	82	3	2	6	28	39	160

Note:

** For BCA at SRTMUN, yet to be defined / will be finalised after complete detailing of 3 years or 4 years BCA as and when approved by BoS / Academic Council/ University norms.

Choice will be given for Students to take extra credit course from their own institute/college/ department or from other institute/college/ department as per the Admitting Body / University norms.

Examination: It will be held twice a year as per the policy of the university, usually as mentioned below.

Sr. No.	Name of the Examination	Main Examination	Supplementary Examination
1	BCA –Semester I, III, V, VII (For Honours and Research)	Winter	Summer
2	BCA –Semester II, IV, VI, VIII (For Honours and Research)	Summer	Winter

The examination specified in the preceding paragraph shall be held semester-wise at such places and on such dates as prescribed by the University.

Mapping of Marks to Grades: The mapping of marks to grades may be done as per the policy and norms of the university, enacted time to time. The AICTE Model syllabus has recommended following table.

Range of Marks	Assigned Grade
91-100	A+
81-90	A
71-80	B+
61-70	B
51-60	C+
46-50	C
40-45	D
< 40	F (Fail due to less marks)
-	F^R (Fail due to shortage of attendance and therefore, to repeat the course)

Eligibility Criteria for Higher Semester Examinations:

1) The university rules shall be followed when admitting students into the next higher semester for BCA. However the AICTE Model syllabus has recommended following table

Sr. No.	Semester	ATKT/Promotion Rules
1	I	----------
2	II	Students enrolled in **Semester I** shall be allowed to keep the term for **Semester II**, provided they have appeared for at least one paper in the University Examination of Semester I.
3	III	The candidate must pass at least 40% of the total subjects (i.e., 6 papers out of 15, including Practicals) from both **Semester I** and **Semester II** combined.
4	IV	A student enrolled in **Semester III** shall be allowed to keep the term for **Semester IV**, provided they have appeared for at least one paper in the University Examination of Semester III.
5	V	The candidate must have cleared all papers from the first year (i.e., all papers from Semester I and Semester II, including Practicals) and must pass at least 40% of the total subjects (i.e., 5 papers out of 12, including Practicals) from both **Semester III** and **Semester IV** combined.

2) To be eligible for admission to the BCA (Honours) or BCA (Honours with Research) program, a student must have successfully completed a 3-year BCA program.

Language of Examination: The medium of instruction and examination will be English unless otherwise specified in the syllabus, except for Indian or foreign languages selected by students in the AEC course.

INDUCTION PROGRAM

Induction Program aimed at instilling core values and ethics in students, setting a precedent for a holistic educational journey that mirrors global standards. The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program', as available on AICTE Portal. Please follow the Guide for Induction Program as suggested in AICTE Model Syllabus. The link for the reference is as given below,

https://www.aicte-india.org/sites/default/files/Model_Curriculum/BCA%20FINAL(2%20year%20).pdf on Page no. 131, Refer Appendix III)

Induction Program (Mandatory)	Three-Week Duration

Induction program for students to be offered right at the start of the first year.	• Physical Activity
	• **Creative Arts**: Painting, Sculpture, Pottery, Music, Dance etc.
	• **Universal Human Values**: Ethics, Rules and Regulation.
	• **Literary**: Debate, Critical Conversation, Analytical Exchange, Reasoned Discourse, etc.
	• **Proficiency Modules**:
	   o English Spoken Classes
	   o Basic of Information and Communication Technology
	   o Basic of Internet, Google Drive
	   o Computer Security & Cyber Crime Law etc.
	• **Lectures by Eminent People**: People who are socially active or in public life.
	• **Visits to Local Areas**: Landmarks of the city, or a hospital or orphanage could be organized.
	• **Familiarization to Department/Branch & Innovations**: Discuss the available facilities, types of events organized, programs, Avishkar, and ongoing research activities.

Mandatory Visits / Workshop/ Expert Lectures:

- It is mandatory to arrange one industrial visit every semester for the students.
- It is mandatory to conduct a One-week workshop during the winter break after fifth semester on Professional/ Industry/ Entrepreneurial orientation.
- It is mandatory to organize at least one expert lecture per semester by inviting resource persons from domain specific industry.

Semester wise Structure and Curriculum for UG Course in BCA

Semester -I

S. No.	Course Code	Course Title	L	T	P	Credit	% of Assessment			
							UA	CA	Total	Minimum passing %
3 WEEKS COMPULSORY INDUCTION PROGRAM (As mentioned in the AICTE guidelines)										
1	SBCACT1101	Mathematics Foundations to Computer Science -I	3	0	0	3	60	15	75	40%
2	SBCACT1102	Computer Architecture	3	0	0	3	60	15	75	40%
3	SBCACP1101	Lab-1 Computer Architecture	0	0	4	2	30	20	50	40%
4	SBCAST1101	Problem Solving Techniques	3	0	0	3	60	15	75	40%
5	SBCASP1101	Lab-1 Problem Solving Techniques	0	0	4	2	30	20	50	40%
6	SBCAE1101	General English – I OR suggested MOOC courses	1	1	0	2	40	10	50	40%
7	SBCAMD1101	Indian Knowledge System (as per the SRTMUN common syllabus for all faculties)	2	0	0	2	-	50	50	40%
8	SBCAVA1101	Environmental Science and Sustainability	2	0	0	2	-	50	50	40%
9	SBCAAE1102	Additional Course – Indian or Foreign Language Other than Mother Tongue and English ((1-1-0) [Optional Course] as per the SRTMUN common syllabus for all faculties mentioned as AEC courses in Indian / Foreign language) choose any one *	1	1	0	0*	-	25	25	40%
Total			15	2	8	19	280	220	500	

Note: For University Assessment (UA), College Assessment (CA) Evaluation Rules, Practical Assessment and for Question Paper Pattern refer to policy of the university

Note:

* Indian Languages: as per the SRTMUN common syllabus for all faculties mentioned as AEC courses in Sanskrit/Hindi/All Regional languages. The Foreign Languages: depending upon offering by the SRTM University and as per the SRTMUN common syllabus for all faculties mentioned as AEC courses like Spanish/German/French/Korean/Mandarin etc. The credits and credit pattern is as per SRTMUN norms

Semester-II

S. No.	Course Code	Course Title	L	T	P	Credit	% of Assessment			
							UA	CA	Total	Minimum passing %
1	SBCACT1151	Mathematics Foundations to Computer Science -II	3	0	0	3	60	15	75	40%
2	SBCACT1152	Data Structures	3	0	0	3	60	15	75	40%
3	SBCACT1153	Operating Systems	3	0	0	3	60	15	75	40%
4	SBCACP1151	Lab-2 Data Structures	0	0	4	2	30	20	50	40%
5	SBCACP1152	Lab-3 Operating System	0	0	2	1	15	10	25	40%
6	SBCAST1151	Object Oriented Programming using Java	3	0	0	3	60	15	75	40%
7	SBCASP1151	Lab-2 Object Oriented Programming using Java	0	0	4	2	30	20	50	40%
9	SBCASP1152	Lab-3 Web Technologies	0	0	4	2	30	20	50	40%
10	SBCAVA1151	Constitution of India (as per the SRTMUN common syllabus (VEC course) for all faculties)	2	0	0	2	-	50	50	40%
11	SBCAE1151	Additional Course – Indian or Foreign Language Other than Mother Tongue and English ((1-1-0) [Optional Course] as per the SRTMUN common syllabus for all faculties mentioned as AEC courses in Indian / Foreign languages(Choose any one))*	1	1	0	0*	-	25	25	40%
	Total		16	1	12	21	345	205	550	

Note: For University Assessment (UA), College Assessment (CA) Evaluation Rules, Practical Assessment and for Question Paper Pattern refer to policy of the university

Note:

* Indian Languages: as per the SRTMUN common syllabus for all faculties mentioned as AEC courses in Sanskrit/Hindi/All Regional languages. The Foreign Languages: depending upon offering by the SRTM University and as per the SRTMUN common syllabus for all faculties mentioned as AEC courses like Spanish/German/French/Korean/Mandarin etc. The credits and credit pattern is as per SRTMUN norms

After Year 1, Students are advised to take Social Responsibility & Community Engagement - encompassing Community Engagement with an NGO in the vacation time.

An UNDER GRADUATE CERTIFICATE IN COMPUTER APPLICATION will be awarded, if a student wishes to exit at the end of First year. Exit Criteria after First Year of BCA Programme

Students will have the option to exit the Bachelor of Computer Application (BCA) program after successfully completing the first year. Upon exit, they will be awarded a **UG Certificate in Computer Application**.

To be eligible for this certificate, students must complete an additional 04 credits in one of the following areas:

- **Skill-Based Subject**: A course designed to enhance practical and technical skills in the field of computer applications.
- **Work-Based Vocational Course**: A vocational course offered during the summer term that emphasizes hands-on training and workplace readiness.
- **Internship/Apprenticeship**: A professional internship or apprenticeship program in a relevant field, with a minimum duration of 08 weeks, which will take place after the second semester.
- **Social Responsibility & Community Engagement**: Active engagement with an NGO or community organization for a minimum duration of 08 weeks, focusing on real-world problem-solving, social responsibility, and community service.

The mode and specifics of these additional credits can be earn as decided by college and students will be required to complete the 08-week program during the summer term following their second semester.

The exiting students will clear the subject / submit the Internship Report as per the University schedule.

Re-entry Criteria in to Second Year (Third Semester)

The student who takes an exit after one year with an award of certificate may be allowed to re-enter in to Third Semester for completion of the BCA Program as per the respective College/University /Admitting Body schedule after earning requisite credits in the First year.

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Guidelines for the Course Assessment:

Continuous Assessment (CA) of theory and practical courses:

i. **For Theory Course:** CA shall form 15 marks and shall be carried out over the entire semester. It shall be done by conducting Two Tests (Test I on 40% curriculum) and Test II (on remaining syllabus) and average of the marks scored by a student in these two tests of a particular course /paper shall be taken as the CA score.

ii. **For Practical Course:** CA shall be for 20 marks and shall be the marks scored by a student in the internal practical examination conducted by the concerned teacher.

iii. **For AE, MD, VA, AE, etc. courses:** CA marks are same as displayed in the structure and are given as per the policy of the university or in absence of university guidelines, as decided by the concerned teacher/ institution.

End Semester Assessment (80% of the Maximum Marks) of theory and practical courses:

A. For illustration a course / paper of 03 credits / 60 marks has been considered. The Question Paper Pattern of the ESA:

Faculty of Science and Technology
BCA
Question paper format (As per NEP2020)

Time : 3 hrs	*Max. Marks: 60*

Instructions to the candidates:
1. *Question No. 1 is Compulsory.*
2. *From Q. No. 2 to 5 solve any three questions.*
3. *Figures to the right indicate full marks.*
4. *Assume suitable data, if necessary.*
5. *Use of any electronic media such as mobile phone, digital diary, and electronic calculator is not permitted.*

Q.1 Attempt the following (any three)   **(15) Marks**
      (Based on all units)
a)
b
c)
d)
e)

Q. 2 Attempt of the following (any three)   **(15)**
      (Based on unit 2)
    a)
    b)
    c)
    d)

Q. 3 Solve the following (any three)   **(15)**
(Based on unit 2)
    a)
    b)
    c)
    d)

Q. 4 Attempt of the following (any three)   **(15)**
(Based on unit 3)
    a)
    b)
    c)
    d)

Q. 5 Attempt of the following (any three)   **(15)**
(Based on unit 4)
    a)
    b)
    c)
    d)

******

B. **For illustration a course / paper of 02 credits / 40 marks has been considered. The Question Paper Pattern of the ESA:**

Faculty of Science and Technology
BCA
Question paper format (As per NEP-2020)

Instructions to the candidates:
6. *Question No. 1 is Compulsory.*
7. *From Q. No. 2 to 5 solve any three questions.*
8. *Figures to the right indicate full marks.*
9. *Assume suitable data, if necessary.*
10. *Use of any electronic media such as mobile phone, digital diary, and electronic calculator is not permitted.*

Q.1 Attempt the following (2 Marks each)   (10)
          (Based on all units/ Module)
a)
b
c)
d)
e)

Q. 2 Attempt of the following (any two) (5 Marks each)   (10)
          (based on unit/ Module 1)
     a)
     b)
     c)
Q.3 Attempt of the following (any two) (5 Marks each)   (10)
(based on unit/module 2)
     a)
     b)
     c)

Q. 4 Attempt of the following (any two) (5 Marks each)   (10)
(based on unit/Module 3)
     a)
     b)
     c)
Q. 5 Attempt of the following (any two) (5 Marks each)   (10)
(based on unit/ Module 4)
     a)
     b)
     c)

*****

The syllabus for higher Years (Second/ Third / Fourth) will be displayed separately

Detailed Syllabus

SEMESTER –I

SEMESTER –I

Mathematics Foundation to Computer Science - I

SBCACT1101	Mathematics Foundation to Computer Science - I	3L:0T:0P	3 Credits

Course Objectives

CO1: Provide a basic understanding of fundamental mathematical concepts such as sets, functions, matrix algebra, and discrete mathematics.

CO2: This course enables the students to use mathematical models and techniques to analyze and understand problems in computer science.

CO3: This course demonstrates how the mathematical principles give succinct abstraction of computer science problems and help them to efficiently analyze.

Course Content:

UNIT I: **Set Theory**

Set, Set Operations, Properties of Set operations, Subset, Venn Diagrams, Cartesian Products.
Power sets, Partitions of set, Principle of inclusion and exclusion.

UNIT II**: Relation and Function**

Relations on a Set, Types of Relations, Properties of Relations, Equivalence Relation, Functions,
types of functions, composition of functions, inverse of functions. Some useful functions for
Computer Science: Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor
functions.

UNIT III: **Matrix and Determinant**

Matrix, Types of matrices, algebra of matrices–addition, subtraction, and multiplication of matrices,
determinant of a matrix, symmetric and skew-symmetric matrices, orthogonal matrix, rank of a matrix,
inverse of a matrix, applications of matrices to solve system of linear equations in two variables.

UNIT IV: **Graph Theory**

Graphs, Basic terminologies of graphs, types of graphs, connected and disconnected graphs, subgraph,
Walks, paths and circuits, , digraphs, weighted graphs, Euler and Hamiltonian graphs,
Trees, properties of trees, spanning tree. Definitions and basic results on the topics mentioned.

Text Books

1. Garg, Reena, Engineering Mathematics, Khanna Book Pub Co, 2024.
   (AICTE Recommended Textbook)

2. Garg, Reena, Advanced Engineering Mathematics, Khanna Book Pub Co, 2023,

3. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition,
   Pearson Education, 2015.

4. Deo Narsingh, Graph Theory with Application to Engineering and Computer Science,
   Prentice Hall, India, 1979.

5. Vasishtha A. R. and Vasishtha A. K., Matrices, Krishna Prakashan, 2022.

Reference Books

1. Grimaldi Ralph P. and Ramana B. V., Discrete and Combinatorial Mathematics: An
   Applied Introduction, Fifth Edition, Pearson Education, 2007.

2. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications,
   McGraw Hill, India, 2019.

3. West Douglas B., Introduction to Graph Theory, Second Edition, Pearson Education,2015

Web Resources

1. https://nptel.ac.in/courses/106103205

2. https://nptel.ac.in/courses/111101115

Computer Architecture

SBCACT1102	Computer Architecture	3L:0T:0P	3 Credits

Course Objectives

CO1: To Understand the basics of Digital Electronics and Binary Number System CO2: To Learn the implementation of Combinational Circuit.

CO3: To Learn the implementation of Sequential Circuit.

CO4: To Understand the Organization of basic computers.

CO5: To Understand the concept of Parallel Processing.

CO6: To understand the concept of memory organization.

Course Content:

UNIT-I

Digital Principles: Definition for Digital signals, Digital logic, Digital computers, Von Neumann Architecture, Logic Gates, Boolean Laws and Theorems, K-Map: Truth Tables to K-Map, 2, 3 and 4 variable K Map, K-Map Simplifications, Don't Care Conditions, SOP and POS.
Number Systems: Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic, Error detecting and correcting codes.

UNIT-II

Combinational Circuits: Half Adder and Full Adder, Subtractor, Decoders, Encoder, Multiplexer, Demultiplexer
Sequential Circuits: Flip-Flops- SR Flip- Flop, D Flip-Flop, J-K Flip-Flop, T Flip-Flop.
Register: 4 bit register with parallel load, Shift Registers- Bidirectional shift register with parallel load
Binary Counters-4 bit synchronous and Asynchronous binary counter.

UNIT-III

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator logic. Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control,

UNIT-IV

Parallel Processing. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input-Output Processor(IOP).

Text Books:

1. Donald P Leach, Albert Paul Malvino, Goutam Saha- "Digital Principles & Applications" , Tata McGraw Hill Education Private Limited,2011Edition.

2. M. Morris Mano- "Computer System Architecture", Pearson/Phi, Third Edition.

3. Dr.S.B.Kishor Digital Electronics , Dasganu Prakashan Nagpur.

Reference Books:

1 William Stallings- "Computer Organization and Architecture", Pearson/PHI, Sixth Edition,

2 Andrew S. Tanenbaum- "Structured Computer Organization", PHI /Pearson 4th Edition,

3 M.V .Subramanyam, "Switching Theory and Logic Design", Laxmi Publications (P) Ltd.

SBCACP1101	Lab-1: Computer Architecture	0L:0T:4P	2 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon   coverage of syllabus points. However the modified list must match with CO-PO mapping

Suggestive Laboratory Experiments:

1. Verify logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates.

2. To study and verify NAND as a Universal Gate

3. To verify De- Morgan's theorem for 2 variables

4. Design and test of an S-R flip-flop using NAND/NOR gate.

5. Convert BCD to Excess-3 code using NAND gate

6. To Convert Binary to Grey Code

7. Verification of Truth Tables of J-K Flip-Flop using NAND/NOR gate

8. Realize Decoder and Encoder circuit using Basic Gates.

9. Design and implement the 4:1 MUX using gates.

10. Implementation of 4-Bit Parallel Adder Using 7483 IC.

11. Design and verify operation of half adder and full adder.

12. Design and verify operation of half subtractor.

13. Design and Implement a 4 bit shift register using Flip flops.

14. Implement Boolean function using logic gates in both SOP and POS

15. Design and Implement a 4 bit synchronous counter.

16. Design and verify 4 bit asynchronous counter.

Hardware

1. Familiarize the computer system layout: marking positions of SMPS, motherboard, FDD, HDD, CD, DVD and add on cards.

2. Identify the Computer Name and Hardware Specification (RAM capacity, Processor type, HDD, 32 bit/ 64 bit)

3. Identify and Troubleshoot the problems of RAM, SMPS and motherboard

4. Configure BIOS settings- disable and enable USB and LAN 5. Adding additional RAM to the system.(expanding RAM size).

6. To Study mother board layout of a system.

7. Demonstrate the assembly of a PC

8. Demonstration of various ports: CPU, VGA port, PS/2 (keyboard, mouse) ,USB, LAN, Speaker, Audio.

9. Install and configure windows OS

10. To study the installation of Printer and trouble shooting.

Problem Solving Techniques

SBCAST1101	Problem Solving Techniques	3L:0T:0P	3 Credits

Course Objectives

CO1: Understand basic terminology of computers, problem solving, programming Languages and their evolution (Understand)

CO2: Create specification from problem requirements by asking questions to disambiguate the requirement statement. (Create)

CO3: Design the solution from specification of a problem and write pseudo code of the algorithm using basic building blocks or structured programming constructs (Sequence, Selection and Repetition statement). (Create)

CO4: Translate an algorithm into a C computer program (Create)

CO5: Testing and analysing programs using debugging tools. (Analyze)

Prerequisite: This is an introductory programming course and hence no prerequisites

Course Content:

UNIT I: (CO-1, CO-2)

Problems And Problem Instances, Generalization and Special Cases, Types of Computational Problems, Classification of Problems, Analysis of Problems, Solution Approaches, Algorithm Development, Analysis of Algorithm, Efficiency, Correctness, Role of Data Structures in Problem Solving, Problem-Solving Steps (Understand the Problem, Plan, Execute, And Review)

UNIT II: (CO-2, CO-3, CO-4)

C Language: Introduction To Programming Languages, Different Generations of Programming Languages. History of C Language, An Empty C Program. C Language Counterparts For Input (scanf()), Output (printf()) Statements.

Structured Programming Concepts: Sequence (Input/Output/Assignment), Selection (If, If-Else) And Repetition (For, While, Do-While) Statements, Control Structure Stacking and Nesting.

Different Kinds of Repetitions: Entry Controlled, Exit Controlled, Counter Controlled, Pseudocode and Flowcharts. Definition And Characteristics of Algorithms, Standard Algorithm Format. Problems Involving Iteration and Nesting: Displaying Different Patterns and Shapes Using Symbols and Numbers, Fibonacci and Other Sequences, ASCII, UNICODE.

UNIT III: (CO-2, CO-3, CO-4)

Assignment, Arithmetic, Relational and Logical Operators. If, If-Else Statements, For, While, Do-While Statements. Data Types. Translating Pseudocode/Algorithm to C Program. Incremental Compilation and Testing of The C Program. Simple Problems Involving Input, Output, Assignment Statement, Selection and Repetition. Good Coding Practices

Problems on Numbers: Extracting Digits of a Number (Left to Right and Right to Left), Palindrome, Prime Number, Prime Factors, Perfect Number, Armstrong Number, Factorial.

C Language: else-if Ladder, switch Case, Increment/Decrement Operators, break and continue Statements.

UNIT IV: (CO-2, CO-3, CO-4, CO-5)

Modular Programming, Top-Down and Bottom-Up Approaches to Problem Solving. Recursion. Problems on Arrays: One Dimensional and Two-Dimensional Arrays ,Reading and Writing of Array Elements, Maximum, Minimum, Sum, Average, Median and Mode.

C Language: Function Definition and Declaration (Prototype), Role of Return Statement. String Functions. Other Operators, Operator Precedence and Associativity. Debugging.

Introduction to Pointers

Text Books

1. Venkatesh, Nagaraju Y, Practical C Programming for Problem Solving, Khanna Book Publishing Company, 2024.

2. AICTE's Programming for Problem Solving (with Lab Manual), Khanna Book Publishing Company, 2024.

3. Harvey Deitel and Paul Deitel, C How to Program, 9th edition, Pearson India, 2015.

4. R G Dromey, How to Solve It by Computer.

5. Dr.S.B.Kishor, Programming Using C,Dasganu Prakashan,Nagpur.

Reference Books

1. Brian W. Kernighan and Dennis Ritchie, The C Programming Language, 2nd edition, Pearson, 2015.

2. Jeri Hanly and Elliot Koffman, Problem Solving and Program Design in C, 8th edition, Pearson, 2015.

SBCASP1101	Lab-1 :Problem Solving Techniques	0L:0T:4P	2 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However the modified list must match with CO-PO mapping

UNIT-II Practicals

1. Converting degrees Celsius to Fahrenheit and vice versa?

2. Display three input numbers in sorted (non-decreasing) order?

3. Given a positive integer value n (>= 0) display number, square and cube of numbers from 1 to n in a tabular format?

4. Given an input positive integer number, display odd numbers from in the range [1,n]?

5. Display first mathematical tables, each table up to 10 rows? Generalise this to display first n (> 0) mathematical tables up to m (m > 0) rows?

6. Display following patterns of n rows (n > 0), For the below examples n = 5? For each pattern write a separate algorithm/program?

$	$	12345	12345
$$	$$	1234	1234
$$$	$$$	123	123
$$$$	$$$$	12	12
$$$$$	$$$$$	1	1

7. Given the first term (a), difference/multiplier (d) and number of terms (n > 0), display the first n terms of the arithmetic/geometric progression?

8. Display the first n (n > 0) terms of the fibonacci sequence?

9. Display the first n (n > 0) terms of the Tribonacci sequence?

10. Given two positive integer numbers n1 and n2 check if the numbers are consecutive numbers of the fibonacci sequence?

11. Compute approximate value of π considering first n (n > 0) terms of theTaylor series for π?

12. Compute approximate value of ex considering first n (n > 0) terms of the Taylor series for ex?

13. Compute approximate value of sin(x)/cos(x) considering first n (n > 0) terms of the Taylor series for sin(x)/cos(x)?

14. Display the following patterns of n rows (n > 0), for the below examples n = 5?

Hollow square pattern:	Triangle Patterns with numbers:	Square with diagonals:	Diamond Pattern
#####		* * * *	
# #	1	*	*
# #	121		
# #	12321	* * * *	***
#####	1234321		*****
	123454321	* * *	***
		* * * *	*
		* * * * *	

UNIT-III Practicals

1. Extract digits of an integer number (left to right and right to left)?

2. Given a sequence of digits form the number composed of the digits. Use sentinel controlled repetition to read the digits followed by -1. For example, for the input 2 7 3 2 9 -1 the output number is 27329?

3. Check if a given positive integer number is a palindrome or not?

4. Compute character grade from the marks (0 ≤ marks ≤ 100) of a subject. Grading Scheme: 80-100 : A, 60 - 79: B, 50 - 59: C, 40-49: D, 0-39: F? Solve this using both else-if ladder and switch case?

5. Compute the sum of a sequence of numbers entered using sentinel controlled repetition?

6. Check if a given positive integer number is a prime number or not?

7. Compute prime factors of a positive integer number?

8. Check if two positive integer numbers are amicable numbers or not?

9. Check if a given positive integer number is a perfect number or not?

10. Check if a given positive integer number Armstrong number or not?

11. Converting a positive integer number (n > 0) from one base (inputBase) to another base (outputBase) (2 <= input Base, outputBase <= 10). Input number should be validated before converting to make sure the number uses only digits allowed in the input base?

12. Write a program to display a number in text form. For example If the number is 5432 the output should be "FIVE FOUR THREE TWO"?

13. Using the grading scheme described in the question 4 (UNIT III), Compute how many students awarded each grade and display the frequency as a bar chart (horizontal) using single "*" for each student. Use sentinel controlled repetition (-1 as sentinel value) in reading the students marks. Use else-if ladder/switch case to compute the grade and the corresponding frequency.

Sample bar chart when the class has 7-A, 10-B, 3-C, 7-D and 1-F grades.

A: *******
B:
****
 C: *** D:
****
F: *

14. Compute maximum, minimum, sum and average of a sequence of numbers which are read using sentinel controlled repetition using only few variables?

15. Compute body mass index, BMI = weightinKGs / (HeightinMeters *HeightinMeters), Both weight and height values are positive real numbers. Your program should display BMI value followed by whether the person is Underweight, Normal, Overweight or Obese using the below ranges:

BMI Values

Underweight: less than 18.5

Normal: >=18.5 and <25

Overweight: >=25 and < 30

Obese: >= 30

UNIT IV Practicals

1. Design a modularized algorithm/program to check if a given positive integer number is a circular prime or not?

2. Design a modularized algorithm/program to compute a maximum of 8 numbers?

3. Design a modular algorithm/program which reads an array of n integer elements and outputs mean (average), range (max-min) and mode (most frequent elements)?

4. Design a modular algorithm/program which reads an array of n integer elements and outputs median?

5. Implement your own string length and string reversal functions?

6. Design algorithm/program to perform matrix operations addition, subtraction and transpose?

7. Write a recursive program to count the number of digits of a positive integer number?

8. Recursive solutions for the following problems:

   a. Factorial of a number?

   b. Display digits of a number from left to right (and right to left)?

   c. Compute x^y using only multiplication?

   d. To print a sequence of numbers entered using sentinel controlled repetition in reverse order?

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General English – I

SBCAAE1101	General English - I	1L:1T:0P	2 Credits

Course Objective:

1. To provide learning environment to practice listening, speaking, reading and writing skills.

2. To assist the students to carry on the tasks and activities through guided instructions and materials.

3. To effectively integrate English language learning with employability skills and training.

4. To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

Course Content:

Unit- I: Phonology: Study of Speech Sounds

Sounds: Consonants (24), Sounds: Vowels (20), Three Term Label, Word Transcription

Unit-II: Morphology & Vocabulary Building

Open Word Classes, Closed word Classes, Noun Phrase, Verb Phrase, Adjective Phrase, Adverb Phrase, Prepositional Phrase, The concept of Word Formation, Root words, Acquaintance with prefixes and suffixes, standard abbreviations.

Unit- III: Syntax & Identifying Common Errors in Writing

Elements of Clause, Basic Clause types, Simple Sentence, Complex Sentence, Compound Sentence Subject-verb agreement, Common Errors in English

Unit-IV: Oral Communication (This Module involves interactive practice sessions in Language Lab)

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

Text/Reference Books:

1. AICTE's Prescribed Textbook: Communication Skills in English (with Lab Manual), Anjana Tiwari, Khanna Book Publishing Co., 2023.
2. Effective Communication Skills. Kul Bhushan Kumar, Khanna Book Publishing, 2022.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. Remedial English Grammar. F.T. Wood. Macmillan.2007

5. On Writing Well. William Zinsser. Harper Resource Book. 2001

6. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

7. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
   8. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

8. Modern English Grammar, L. S. Deshpande, Creative Publication.

9. English for Practical Purposes, Z. N. Patil, Macmillan Publishers India Limited.

Alternative NPTEL/SWAYAM Course:

S.No.	NPTEL/SWAYAM Course Name	Instructor	Host Institute
1	English language for competitive exams	Prof. Aysha iqbal	IIT MADRAS
2	Technical English for engineers	Prof. Aysha iqbal	IITM

Course Outcomes: The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills

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Indian Knowledge System

SBCAMD1101	Indian Knowledge System	2L:0T:0P	2 Credits

IKS as per the SRTMUN common Syllabus for all faculties

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Environmental Science and Sustainability

SBCAVA1101	Environmental Science and Sustainability	2L:0T:0P	2 Credits

Course description:

This course aims to familiarize students with fundamental environmental concepts and their relevance to business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers. The course content is divided into four comprehensive units. Unit 1 introduces basic environmental principles, the man-environment relationship, and sustainability issues.

Unit 2 focuses on ecosystems, biodiversity, and sustainable practices.

Unit 3 addresses environmental pollution, waste management, and sustainable development strategies. Finally,

Unit 4 explores social issues, environmental legislation, and practical applications through hands-on fieldwork. Through this holistic approach, students will gain a deep understanding of environmental processes, the importance of sustainable practices, and their role in promoting sustainability within business contexts.

Course Objective(s):

1. This course aims to familiarize students with basic environmental concepts, their relevance to business operations, and forthcoming sustainability challenges.
2. This course will equip students to make decisions that consider environmental consequences.
3. This course will enable future business graduates to become environmentally sensitive and responsible managers.

Course Outcome(s):

1. Explore the basic environmental concepts and issues relevant to the business and management field.
2. Recognize the interdependence between environmental processes and socio-economic dynamics.
3. Determine the role of business decisions, policies, and actions in minimizing environmental degradation.
4. Identify possible solutions to curb environmental problems caused by managerial actions.
5. Develop skills to address immediate environmental concerns through changes in business operations, policies, and decisions.

Course Content:

Unit 1: Understanding Environment, Natural Resources, and Sustainability
Fundamental environmental concepts and their relevance to business operations; Components and segments of the environment, the man-environment relationship, and historical environmental movements. Concept of sustainability; Classification of natural resources, issues related to their overutilization, and strategies for their conservation. Sustainable practices in managing resources, including deforestation, water conservation, energy security, and food security issues. The conservation and equitable use of resources, considering both intergenerational and intergenerational equity, and the importance of public awareness and education.

Unit 2: Ecosystems, Biodiversity, and Sustainable Practices
Various natural ecosystems, learning about their structure, functions, and ecological characteristics. The importance of biodiversity, the threats it faces, and the methods used for its conservation. Ecosystem resilience, homeostasis, and carrying capacity, emphasizing the need for sustainable ecosystem management.

Unit 3: Environmental Pollution, E-Waste Management, and Sustainable Development
Various types of environmental pollution, including air, water, noise, soil, and marine pollution and their impacts on businesses and communities. Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; E-waste and their management.

Unit 4: Social Issues
Dynamic interactions between society and the environment, with a focus on sustainable development and environmental ethics. Role of businesses in achieving sustainable development goals and promoting responsible consumption.

Readings:

Text Books (Latest Editions):
- Poonia, M.P. *Environmental Studies* (3rd ed.), Khanna Book Publishing Co.
- Bharucha, E. *Textbook of Environmental Studies* (3rd ed.) Orient Blackswan Private Ltd.
- Dave, D., & Katewa, S. S. *Text Book of Environmental Studies.* Cengage Learning India Pvt Ltd.
- Rajagopalan, R. *Environmental studies: from crisis to cure* (4th ed.). Oxford University Press. ● Miller, G.T. & Spoolman S. *Living in the Environment*. (20th ed.). Cengage.
- Basu, M., & Xavier Savarimuthu, S. J. *Fundamentals of environmental studies*. Cambridge University Press.
- Roy, M. G. *Sustainable Development: Environment, Energy and Water Resources*. Ane Books.
- Pritwani, K. *Sustainability of business in the context of environmental management.* CRC Press.

- Wright, R.T. & Boorse, D.F. *Environmental Science: Toward A Sustainable Future* (13th ed,). Pearson.

References

Web links:

- https://www.ourplanet.com
- https://www.undp.org/content/undp/en/home/sustainable-development-goals.html ● www.myfootprint.org
- https://www.globalchange.umich.edu/globalchange1/current/lectures/kling/ecosystem/ecosystem.html

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Additional Course

SBCAAE1102	Additional Course – Indian or Foreign Language *	2L:0T:0P	0 *Credits

Additional Course – Indian or Foreign Language Other than Mother Tongue and English(1-1-0) [Optional Course] as per the SRTMUN common syllabus for all faculties mentioned as AEC courses in Indian / Foreign languages   (Choose any one). Credit policy is as per the SRTMUN

SBCAAE1102	Additional Course – Indian or Foreign Language *	2L:0T:0P	0 *Credits

SEMESTER –II

SEMESTER –II

Mathematics Foundation to Computer Science - II

SBCACT1151	Mathematics Foundation to Computer Science - II	3L:0T:0P	3 Credits

Course Objectives

CO1: This course helps the students to understand correct lines of arguments and proofs.

CO2: This course introduces mathematical techniques that are foundations for understanding advanced computational methods, including numerical methods and optimization.

CO3: This course helps the students to understand various problem-solving strategies and methods to tackle both theoretical and practical challenges in computer science.

Course Content:

UNIT I:

Mathematical Logic

Propositions, logical operations (connectives), compound statements, construction of truth table, conditional statements, tautology, contradiction, contingency, logical equivalence.

UNIT II:

Algebraic Structures:

Monoid , Semi-group, Group, Subgroup, Abelian group, Homomorphism, Automorphism and Isomorphism of groups.

UNIT III:

Numerical Methods:

Solution of algebraic and transcendental equations: Bisection method and Newton-Raphson methods. Numerical Interpolation: Newton's Forward and Newton's Backward interpolation formula. Only formula and problem solving for all the topics mentioned above.

UNIT IV:

Optimization Techniques:

Linear programming: Introduction, LP formulation, Graphical method for solving LPs with two variables, Special cases in graphical methods, Simplex method.

Text Books

1. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.

2. Sastry S. S., Introductory Methods of Numerical Analysis, Fifth Edition, PHL, 2022.

3. Taha Hamdy A., Operations Research: An Introduction, Eighth Edition, Pearson Prentice Hall, 2003.

4. S.B. Singh, Discrete Structures, Khanna Book Publishing, 2023 (AICTE Recommended Textbook)

Reference Books

1. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.

2. Chakravorty J. G. and Ghosh P. R., Linear Programming and Game Theory, Moulik Library, 2017.

3. Sharma J. K., Operations Research: Theory and Applications, Fourth Edition, Macmilllan Publishers, 2007.

Web Resources

1. https://nptel.ac.in/courses/111107127
2. https://www.math.iitb.ac.in/~siva/si50716/SI507lecturenotes.pdf

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Data Structures

SBCACT1152	Data Structures	3L:0T:0P	3 Credits

Course Objectives

CO1: Understand the fundamental concepts of Data Structures and their applications.

CO2: Develop problem-solving skills using Data Structures.

CO3: Implement Data Structures using C programming language.

Prerequisite:

1. **Programming Fundamentals:** Understanding the basic syntax and semantics of C programming language.

2. **Problem-Solving Skills:** Ability to break down a problem into smaller steps and devise a step-by-step solution and familiarity with simple algorithms.

Course Content:

UNIT I:

Introduction and Overview: Definition, Classification and Operations of Data Structures. Algorithms: Complexity, Time-Space Tradeoff.

Arrays: Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Operations on Linear Arrays: Traversing, Inserting, Deleting, Searching, Sorting and Merging. Searching: Linear Search and Binary Search, Comparison of Methods. Sorting: Bubble Sort, Selection Sort, and Insertion Sort. Two-Dimensional Arrays, Representation of Two- Dimensional Arrays in Memory, Multi-Dimensional Arrays.

UNIT II:

Linked Lists: Definition, Comparison with Arrays, Representation, Types of Linked lists, Traversing, Inserting, Deleting and Searching in Singly Linked List, Doubly Linked List and Circular Linked List. Applications of Linked Lists

UNIT III:

Stacks: Definition, Representation of Stacks using Arrays and Linked List, Operations on Stacks using Arrays and Linked List, Application of Stacks: Arithmetic Expressions, Polish Notation, Conversion of Infix Expression to Postfix Expression, Evaluation of

Postfix Expression.

Recursion: Definition, Recursive Notation, Run time Stack, Applications of Recursion: Factorial of Number,Fibonacci Series.

Queues: Definition, Representation of Queues using Array and Linked List, Types of Queue: Simple Queue, Circular Queue, Operations on Simple Queues and Circular Queues using Array and Linked List, Applications of Queues.

UNIT IV:

Graphs: Definition, Terminology, Representation, Traversal.

Trees: Definition, Terminology, Binary Trees, Traversal of Binary Tree, Binary Search Tree, Inserting, Deleting and Searching in Binary Search Tree

Text Books

1. R.B. Patel, "Expert Data Structures with C", Khanna Book Publishing Company, 2023 (AICTE Recommended Textbook)

2. Seymour Lipschutz, "Data Structures with C", Schaum's Outlines, Tata McGraw-Hill, 2011.

3. Yashavant Kanetkar, "Data Structures Through C", 4th Edition, BPB Publications, 2022.

Reference Books

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2014.

2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, Universities Press, 2007.

Web Resources

1. **GeeksforGeeks** - Data Structures Tutorial

2. **Khan Academy** - Algorithms Course

SBCACP1151	Lab-2 Data Structures	0L:0T:4P	2 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon   coverage of syllabus points. However the modified list must match with CO-PO mapping

Lab Programs:

1. Write a program for insertion and deletion operations in an array.

2. Write a program to search for an element in an array using Linear Search and Binary Search.

3. Write a program to sort an array using Bubble Sort, Selection Sort and Insertion Sort.

4. Write a program to merge two arrays.

5. Write a program to add and subtract two matrices.

6. Write a program to multiply two matrices.

7. Write a program to insert an element into a Singly Linked List:

    (a) At the beginning

    (b) At the end

    (c) At a specified position

8. Write a program to delete an element from a Singly Linked List:

    (a) At the beginning

    (b) At the end

    (c) A specified element

9. Write a program to perform the following operations in a Doubly Linked List:

    (a) Create

    (b) Search for an element

10. Write a program to perform the following operations in a Circular Linked List:

    (a) Create

    (b) Delete an element from the end

11. Write a program to implement stack operations using an array.

12. Write a program to implement stack operations using a linked list.

13. Write a program to add two polynomials using a linked lists.

14. Write a program to evaluate a postfix expression using a stack.

15. Write a program to perform the following using recursion:

    (a) Find the factorial of a number

    (b) Find the GCD of two numbers

    (c) Solve Towers of Hanoi problem

16. Write a program to implement simple queue operations using an array.

17. Write a program to implement circular queue operations using an array.

18. Write a program to implement circular queue operations using a linked list.

19. Write a program to perform the following operations on a binary search tree.

    (a) Preorder Traversal

    (b) Inorder Traversal

    (c) Postorder Traversal

20. Write a program to perform insertion operation in a binary search tree.

******

Operating Systems

SBCACT1153	Operating Systems	3L:0T:0P	3 Credits

Course Outcomes (COs):

At the end of the course, students will be able to:

CO1: Explain the fundamentals of the operating system.

CO2: Comprehend multithreaded programming, CPU scheduling, process management, process synchronization, memory, deadlocks, and storage management.

CO3: Compare the performance of CPU scheduling algorithms

CO4: Identify the features of I/O and File handling methods.

Course Content:

UNIT I:

Operating Systems Overview: Definition, Evaluation of O.S, Components & Services of OS, Structure, Architecture, types of Operating Systems, Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems.

Operating Systems Structures: Operating system services and systems calls, system programs, operating system structure, operating systems generations.

UNIT II:

Process Management: Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads.

Process Scheduling: Definition, Scheduling objectives, Scheduling algorithms, CPU scheduling Preemptive and Non-preemptive Scheduling algorithms (FCFS, SJF and RR), Performance evaluation of the scheduling Algorithms

UNIT III:

Process Synchronization: Introduction, Inter-process Communication, Race Conditions, Critical Section Problem, Mutual Exclusion, Semaphores, Monitors.

Deadlocks: System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks.

UNIT IV:

Memory Management: Logical and Physical address map, Swapping, Memory allocation, MFT, MVT, Internal and External fragmentation and Compaction, Paging, Segmentation.
Virtual Memory: Demand paging, Page Replacement algorithms, Allocation of frames, thrashing.

I/O Management: Principles of I/O Hardware: Disk structure, Disk scheduling algorithms.

Text Books:

1. Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022 (AICTE Recommended Textbook)

2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition OR Later edition, Wiley India Private Limited, New Delhi.

3. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

4. Dr.S.B.Kishor , Operating System, Dsganu Prakashan , Nagpur.

Reference Books:

1. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India.
2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata McGraw-Hill.

SBCACP1152	Lab -3 : Operating Systems	0L:0T:2P	1 Credits

Course Outcomes (COs):

CO1: To implement scheduling of algorithms.

CO2: Understanding the concept of critical section problems.

CO3: Concepts of file allocation of frames.

CO4: Concept of Page replacement algorithms.

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However the modified list must match with CO-PO mapping

Operating Systems LAB

List of experiments

1. Write C program to simulate the FCFS CPU Scheduling algorithm.

2. Write C program to simulate the SJF CPU Scheduling algorithm.

3. Write C program to simulate the Round Robin CPU Scheduling algorithm.

4. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.

5. Write a C program to implement the Producer – Consumer problem using semaphores.

6. Write a C program to illustrate the IPC mechanism using Pipes.

7. Write a C program to illustrate the IPC mechanism using FIFOs.

8. Write a C program to simulate Paging memory management technique.

9. Write a C program to simulate Segmentation memory management technique.

10. Write a C program to simulate the Best Fit contiguous memory allocation technique.

11. Write a C program to simulate the First Fit contiguous memory allocation technique.

12. Write a C program to simulate the concept of Dining-Philosophers problem.

13. Write a C program to simulate the MVT algorithm.

14. Write a C program to implement FIFO page replacement technique.

15. Write a C program to write a C program for implementing sequential file allocation method.

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Object Oriented Programming using Java

SBCAST1151	Object Oriented Programming using Java	3L:0T:0P	3 Credits

Course Objectives

CO1: To introduce the object oriented programming system concepts

CO2: To introduce syntax and semantics of Java programming language

CO3: To develop modular programs using Java

CO4: To setup JDK environment to create, debug and run Java programs

Prerequisite: Knowledge of Problem Solving Techniques using C programming language

Course Content:

UNIT I:

Fundamentals of Object Oriented Programming: Basic Concepts of Object Oriented Programming (OOP), Benefits and Applications of OOP.

Java Evolution: Java Features, Java Environment.

Overview of Java Language: Introduction to Simple Java Program, Use of Comments and Math function, Application of two classes, Java Program Structure, Java Tokens and statements, Implementing Java program and JVM, Command Line Arguments.

UNIT II:

Constants, Variables and Data Types: Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Typecasting.

Operators & Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment & Decrement operators, conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Type Conversions in Expressions, Operator Precedence & Associativity.

Decision Making, Branching & Looping: Decision Making with Control Statements, looping statements, Jump in loops, Labelled loops.

UNIT III:

Classes, Objects and Methods: Defining Class, Methods Declaration, Constructors, Methods Overloading, Overriding Methods, Inheritance

Arrays, Strings and Vectors: 1D arrays, Creating an Array, 2D arrays, Strings, Vectors, Wrapper Classes, Enumerated Types

Inheritance: Defining, extending classes, and Implementing Interfaces. Multiple inheritance and polymorphism.

UNIT IV:

Packages: Basics of packages, System packages, Creating and accessing packages, Creating user defined packages, Adding class to a package.

Exception Handling: Using the main keywords of exception handling: try, catch,throw, throws and finally; Nested try, Multiple catch statements, Creating user defined exceptions

Text Books

1. Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India: McGraw Hill Education

2. Schildt, H. (2022). Java: The Complete Reference. 12th edition. McGraw-Hill Education.

Reference Books

1. Arunesh Goyal, The Essentials of JAVA, Khanna Book Publishing Company Private Limited, 2012.

2. Tanweer Alam, Core JAVA, Khanna Book Publishing Company Private Limited, 2015.

3. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson, 2008.

4. S. Malhotra and S. Choudhary, Programming in Java, 2nd Edition, Oxford University Press, 2014.

Web Resources

1. https://www.w3schools.com/java/.

2. http://www.java2s.com/.

3. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

SBACSP1151	Lab -2 : Object Oriented Programming using Java	0L:0T:4P	2 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon   coverage of syllabus points. However the modified list must match with CO-PO mapping

List of Practical:

1. Write a program to read two numbers from user and print their product.

2. Write a program to print the square of a number passed through command line arguments.

3. Write a program to send the name and surname of a student through command line arguments and print a welcome message for the student.

4. Write a java program to find the largest number out of n natural numbers.

5. Write a java program to find the Fibonacci series & Factorial of a number using recursive and non recursive functions.

6. Write a java program to multiply two given matrices.

7. Write a Java program for sorting a given list of names in ascending order.

8. Write a Java program that checks whether a given string is a palindrome or not . Ex:MADAM is a palindrome.

9. Write a java program to read n number of values in an array and display it in reverse   order.

10. Create a JAVA class called Student with the following details as variables within it.

    a. USN, NAME, BRANCH, PHONE, PERCENTAGE

    b. Write a JAVA program to create n Student objects and print the USN,Name, Branch, Phone, and percentage of these objects with suitable headings.

11. Write a Java program that displays the number of characters, lines and words in a text.

12. Write a Java program to create a class called Shape with methods called getPerimeter() and getArea(). Create a subclass called Circle that overrides the getPerimeter() and getArea() methods to calculate the area and perimeter of a circle.

13. Write a Java program to create a class Employee with a method called calculateSalary(). Create two subclasses Manager and Programmer. In each subclass, override the calculateSalary() method to calculate and return the salary based on their specific roles.

14. Write a Java program using an interface called 'Bank' having function 'rate_of_interest()'. Implement this interface to create two separate bank classes 'SBI' and 'PNB' to print different rates of interest. Include additional member variables, constructors also in classes 'SBI' and 'PNB'.

15. Write a Java package program for the class book and then import the data from the package and display the result.

16. Write a Java program for finding the cube of a number using a package for various data types and then import it in another class and display the results.

17. Write a Java program for demonstrating the divide by zero exception handling.

18. Write a Java program that reads a list of integers from the user and throws an exception if any numbers are duplicates.

19. Create an exception subclass UnderAge, which prints "Under Age" along with the age value when an object of UnderAge class is printed in the catch statement. Write a class exceptionDemo in which the method test() throws UnderAge exception if the variable age passed to it as argument is less than 18. Write main() method also to show working of the program.

Web Technologies

SBCASP1152	Lab-3 Web Technologies	0L:0T:4P	2Credits

Course Objectives : It is a purely Lab oriented course where concerned teacher shall teach the basics of the Web Technologies covering Unit I and II and simultaneously take practicals as listed in part A and part B

CO1: To understand the concepts and architecture of the World Wide Web, Markup languages along with Cascading Style Sheets.

CO2: To understand the concepts of event handling and data validation mechanisms.

CO3: To understand the concepts of embedded dynamic scripting on client and server side Internet Programming and basic full stack web development. CO4: To develop modern interactive web applications

Prerequisite:

1. Proficiency in at least one programming language, such as Python, Java, or C++. Understanding of programming concepts such as loops, conditionals, functions, and data structures like arrays, lists.

2. Familiarity with object-oriented programming (OOP) principles, including classes, objects, inheritance, and polymorphism.

Course Content:

Unit I:

Introduction to HTML, history of HTML, Objective, basic Structures of HTML, Header Tags, body tags, Paragraph Tags.

Tags for FORM Creation, TABLE, FORM, TEXTAREA, SELECT, IMG, IFRAME FIELDSET, ANCHOR.

Lists in HTML, Introduction to DIV tag, NAVBAR Design.

Introduction to CSS, types, Selectors, and Responsiveness of a web page.

Introduction to Bootstrap, downloads/linking, using classes of Bootstrap, understanding the Grid System in Bootstrap.

Introduction to www, Protocols and Programs, Applications and development tools, web browsers, DNS, Web hosting Provider, Setting up of Windows/Linux/Unix web servers, Web hosting in cloud, Types of Web Hosting.

Unit II:

Introduction to JavaScript: Functions and Events, Document Object model traversing using JavaScript. Output System in JavaScript i.e. Alert, throughput, Input box, Console. Variables and Arrays in JavaScript.Date and String handling in JavaScript.

Manipulating CSS through JavaScript: Form Validation like Required validator, length validator, Pattern validator. Advanced JavaScript, Combining HTML, CSS and JavaScript events and buttons, controlling your browser.Introduction to AJAX, Purpose, advantages and disadvantages, AJAX based Web applications and alternatives of AJAX.

Introduction to XML: uses, Key concepts, DTD 8 schemas, XSL, XSLT,and XSL Elements and transforming with XSLT. Introduction to XHTML.

JSON: Introduction to JSON, Keys and Values, Types of Values, Arrays, Objects

Text Books

1. Laura Lemay, Mastering HTML, CSS & Java Script Web Publishing, BPB Publications, 2016

2. Thomas A. Powell, The Complete Reference HTML & CSS, Fifth Edition, 2017

3. Dr.S.B.Kishor , Web Designing, Dasganu Prakashan, Nagpur.

Reference Books

1. Silvio Moreto, Bootstrap 4 By Example, ebook, 2016.

2. Tanweer Alam, Web Technologies, Khanna Book Publishing, 2011.

Web Resources

3. www.javatpoint.com

4. www.w3schools.com

5. https://www.geeksforgeeks.org/web-technology/

Note: Below Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However the modified list must match with CO-PO mapping

PART-A

1. Create your class time table using table tag.

2. Design a Webpage for your college containing description of courses, department, faculties, library etc. using list tags, href tags, and anchor tags.

3. Create web page using Frame with rows and columns where we will have header frame, left frame, right frame, and status bar frame. On clicking in the left frame, information should be displayed in right frame.

4. Create Your Resume using HTML, use text, link, size, color and lists.

5. Create a Web Page of a super market using (internal CSS) 6.   Use Inline CSS to format your resume that you have created.

7. Use External CSS to format your time table created.

8. Use all the CSS (inline, internal and external) to format college web page that you have created.

9. Write a HTML Program to create your college website using for mobile device.

PART – B

1) Write an HTML/JavaScript page to create login page with validations.

2) Develop a Simple calculator for addiction, subtraction, multiplication and division operation using JavaScript.

3) Use Regular Expressions for validations in Login Page using JavaScript.

4) Write a Program to retrieve date from a text file and displaying it using AJAX.

5) Create XML file to store Student Information like Register Number, Name, Mobile Number, DOB, and Email-Id.

6) Create a DTD for (0).

7) Create XML scheme for (0).

8) Create XSL file to convert XML file to XHTML file.

9) Write a JavaScript program using Switch case.

10) Write a JavaScript program using any 5 events.

11) Write a JavaScript program using built in JavaScript objects.

12) Write program for populating values from JSON text.

13) Write a program to transform JSON text to a JavaScript object.

Constitution of India

SBCAVA1151	Constitution of India	2L:0T:0P	2 Credits

Constitution of India as per the SRTMUN common syllabus (VEC course) for all faculties

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Additional Course

SBCAAE1151	Additional Course – Indian or Foreign Language *	2L:0T:0P	0* Credits

Additional Course – Indian or Foreign Language Other than Mother Tongue and English(1-1-0) [Optional Course]   as per the SRTMUN common syllabus for all faculties mentioned as AEC courses in Indian / Foreign languages   (Choose any one) . Credit policy is as per the SRTMUN

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

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Phone: (02462)215542	**Academic-1 (BOS) Section** E-mail: bos@srtmun.ac.in

विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५—२६ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २७ मे २०२५ रोजी संपन्न झालेल्या मा. विद्यापरिषद बैठकीतील विषय क्रमांक १६/६१—२०२५ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण—२०२० नुसारचे पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५—२६ पासून लागू करण्यास मा. विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी. एस्सी द्वितीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५—२६ पासून लागू करण्यात येत आहेत.

01	B.Sc. Computer Management (Single Major)
02	B.Sc. Information Technology (Single Major)
03	B.Sc. Software Engineering (Single Major)
04	B.Sc. Computer Network Technology (Single Major)
05	B.Sc. Computer Science (Single Major)
06	B.Sc. Artificial Intelligence & Machine Learning (Single Major)
07	B.Sc. BCA (Single Major)
08	B.Sc. Computer Maintenance
09	B.Sc. Computer Science
10	B.Sc. Information Technology
11	B. Sc. Computer Application
12	B. Sc. Software Development
13	B. Sc. Data Science
14	B. Sc. Computer Science (with data Science specialization)

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून घ्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड — ४३१ ६०६.
जा.क्र.:शै—१/एनइपी/विवत्रविपदवी/२०२५—२६/१२६
दिनांक १२.०६.२०२५

सहाय्यक कुलसचिव
शैक्षणिक (१—अभ्यासमंडळ) विभाग

प्रत : माहितीस्तव तथा कार्यवाहीस्तव.

१) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. प्र. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606 (MS)

स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड

(**Credit Framework and Structure of Four Year UG Program with Multiple Entry and Exit Option as per NEP-2020**)

UNDERGRADUATE PROGRAM OF

SCIENCE & TECHNOLOGY UNDER THE BOS OF COMPUTER SCIENCE AND APPLICATION

SY-BCA (Single Major)

(Bachelor in Computer Application)

(Honours and Honours with Research)

Under the Faculty of Science & Technology

(Revised as per the Govt. Of Maharashtra circular Dt. 13-03-2024)

&

(Based on the AICTE model curriculum suggested in Sept 2024)

From the Desk of the Dean, Faculty of Science and Technology

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement "***Enlightened Student: A Source of Immense Power***", is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the University to achieve *the 3Es, the equity, the efficiency* and *the excellence* in higher education of this region. To overcome the difficulty of comparing the performances of the graduating students and also to provide mobility to them to join other institutions the University has adopted the cumulative grade point average (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better employ ability, entrepreneurship possibilities and to enhance the latent skills of the stakeholders the University has adopted the Choice Based Credit System (CBCS) in the year 2018-2019 at graduate and post-graduate level. This provided flexibility to the students to choose courses of their own interests. To encourage the students to opt the world-class courses offered on the online platforms like, NPTEL, SWAYM, and other MOOCS platforms the University has implemented the credit transfer policy approved by its Academic Council and also has made a provision of reimbursing registration fees of the successful students completing such courses.

SRTM University has been producing a good number of high calibre graduates; however, it is necessary to ensure that our aspiring students are able to pursue the right education. Like the engineering students, the youngsters pursuing science education need to be equipped and trained as per the requirements of the R&D institutes and industries. This would become possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Higher education is a dynamic process and in the present era the stakeholders need to be educated and trained in view of the self-employment and self-sustaining skills like start-ups. Revision of the curriculum alone is not the measure for bringing reforms in the higher education, but invite several other initiatives. Establishing industry-institute linkages and initiating internship, on job training for the graduates in reputed industries are some of the important steps that the University would like to take in the coming time. As a result, revision of the curriculum was the need of the hour and such an opportunity was provided by the New Education Policy 2020. National Education Policy 2020 (NEP 2020) aims at equipping students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. As a result the students

will acquire expertise in specialized areas of interest, kindle their intellectual curiosity and scientific temper, and create imaginative individuals.

The curriculum given in this document has been developed following the guidelines of NEP-2020 and is crucial as well as challenging due to the reason that it is a transition from general science based to the discipline-specific-based curriculum. All the recommendations of the Sukanu Samiti given in the NEP Curriculum Framework-2023 have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. All the Board of Studies (BoS) under the Faculty of Science and Technology of this university have put in their tremendous efforts in making this curriculum of international standard. They have taken care of maintaining logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding of the students.

We take this opportunity to congratulate the Chairman(s) and all the members of various Boards of Studies for their immense contributions in preparing the revised curriculum for the benefits of the stakeholders in line with the guidelines of the Government of Maharashtra regarding NEP-2020. We also acknowledge the suggestions and contributions of the academic and industry experts of various disciplines.

We are sure that the adoption of the revised curriculum will be advantageous for the students to enhance their skills and employ ability. Introduction of the mandatory On Job Training, Internship program for science background students is praise worthy and certainly help the students to imbibe first hand work experience, team work management. These initiatives will also help the students to inculcate the workmanship spirit and explore the possibilities of setting up of their own enterprises.

Dr. M. K. Patil

Dean

Faculty of Science and Technology

Program Specific Outcomes:

PSO 01: Students will be able to understand analyses and develop computer programs in the areas related to algorithm, system software, web design and networking for efficient design of computer-based system.

PSO 02: Apply standard software engineering practices and strategies in software project development using open-source programming environment to deliver a quality of product for business success.

PSO 03: Student will be able to know various issues, latest trends in technology development in the field of AI and thereby, innovate new ideas and solutions to existing problems.

PSO 04: Explore technical knowledge in diverse areas of computer applications and experience an environment conducive in cultivating skills for successful career, entrepreneurship and higher studies.

GENERAL COURSE STRUCTURE & THEME

A.   Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hrs. Practical (P) per week	1 Credit

B. Course Code and definition:

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
DSC (CT/CP)	Core Courses
AEC	Ability Enhancement Courses
MDE	Multi-Disciplinary Elective course
VEC	Value added Courses
SEC (ST/SP)	Skill Enhancement courses
DSE (ET/EP)	Discipline Specific Elective
GE/OE	Open Elective
OJT	On Job Training (Internship/ Apprenticeship)
FP	Field Project
CEP	Community Engagement and Service
CC	Co-Curricular Courses
RM	Research Methodology
RP	Research Project /Dissertation

Course Level/Duration/System:

A. Eligibility for Admission: As per the regulations of the SRTMUN, AICTE/DTE and Government of Maharashtra, issued from Time-to-time regarding admission process.

B. As per NEP-2020 policy, it is a UG program (3/4 years) (6/ 8 Semesters) with multiple entry and exit. The following option will be made available to the students joining BCA Research Program:

1. One year: Under Graduate Certificate in Computer Application

2. Two years: Under Graduate Diploma in Computer Application

3. Three years: Bachelor in Computer Application (BCA)

4. Four years: Bachelor in Computer Application with Honours: BCA (Honours) or Bachelor in Computer Application Honours with Research: BCA (Honours with Research)

Note: The students who are eligible for BCA (Honours with Research) shall have choice to pursue either BCA (Honours) or BCA (Honours with Research).

SEMESTER WISE CREDIT DISTRIBUTION: Semester wise credit distribution of proposed BCA [BCA (Honours) and BCA (Honours with research)] program:

Semester	Core Courses	Ability Enhancement Courses (AEC)	Multi-Disciplinary Elective Course (MDE)	Value Added Courses (VEC)	Skill Enhancement courses (SEC)	Discipline Specific Elective (DSE)	Total
I	8	2	2	2	5	-	19
II	12	-	-	2	7	-	21
III	11	-	-	2	4	3	20
IV	15	-	-	-	2	3	20
Higher Semester -Tentative Structure yet to be defined**							
V	-	-	-	-	-	-	19/20
VI	-	-	-	-	-	-	20/21
BCA (Honours) Tentative Structure yet to be defined**							
VII	-	-	-	-	-	-	19/20
VIII	-	-	-	-	-	-	20/21
BCA (Honours with Research) Tentative Structure yet to be defined**							
VII	-	-	-	-	-	-	19/20
VIII	-	-	-	-	-	-	20/21

Category-wise distribution to be followed as per AICTE norms. **

Description	Core Courses (DSC)	Ability Enhancement Courses (AEC)	Multi-Disciplinary Elective course (MDE)	Value Added Courses (VEC)	Skill Enhancement Courses (SEC)	Discipline Specific Elective (DSE)	Total Credits
BCA	50	3	2	6	28	31	120
BCA (Honours)	55	3	5	6	40	51	160
BCA (Honours with Research)	82	3	2	6	28	39	160

Note:

** For BCA at SRTMUN, yet to be defined / will be finalised after complete detailing of 3 years or 4 years BCA as and when approved by BoS / Academic Council/ University norms.

Choice will be given for Students to take extra credit course from their own institute/college/ department or from other institute/college/ department as per the Admitting Body / University norms.

Examination: It will be held twice a year as per the policy of the university, usually as mentioned below.

Sr. No.	Name of the Examination	Main Examination	Supplementary Examination
1	BCA –Semester I, III, V, VII (For Honours and Research)	Winter	Summer
2	BCA –Semester II, IV, VI, VIII (For Honours and Research)	Summer	Winter

The examination specified in the preceding paragraph shall be held semester-wise at such places and on such dates as prescribed by the University.

Mapping of Marks to Grades: The mapping of marks to grades may be done as per the policy and norms of the university, enacted time to time. The AICTE Model syllabus has recommended following table.

Range of Marks	Assigned Grade
91-100	A+
81-90	A
71-80	B+
61-70	B
51-60	C+
46-50	C
40-45	D
< 40	F (Fail due to less marks)
-	F^R (Fail due to shortage of attendance and therefore, to repeat the course)

Eligibility Criteria for Higher Semester Examinations:

1) The university rules shall be followed when admitting students into the next higher semester for BCA. However, the AICTE Model syllabus has recommended following table

Sr. No.	Semester	ATKT/Promotion Rules
1	I	----------
2	II	Students enrolled in **Semester I** shall be allowed to keep the term for **Semester II**, provided they have appeared for at least one paper in the University Examination of Semester I.
3	III	The candidate must pass at least 40% of the total subjects (i.e., 6 papers out of 15, including Practicals) from both **Semester I** and **Semester II** combined.
4	IV	A student enrolled in **Semester III** shall be allowed to keep the term for **Semester IV**, provided they have appeared for at least one paper in the University Examination of Semester III.
5	V	The candidate must have cleared all papers from the first year (i.e., all papers from Semester I and Semester II, including Practicals) and must pass at least 40% of the total subjects (i.e., 5 papers out of 12, including Practicals) from both **Semester III** and **Semester IV** combined.

2) To be eligible for admission to the BCA (Honours) or BCA (Honours with Research) program, a student must have successfully completed a 3-year BCA program.

Language of Examination: The medium of instruction and examination will be English unless otherwise specified in the syllabus, except for Indian or foreign languages selected by students in the AEC course.

Semester wise Curriculum for UG Course in BCA Semester –III

S. No.	Course Code	Course Title	L	T	P	Credit	% of Assessment			
							UA	CA	Total	Minimum passing %
1	SBCACT1201	Probability and Statistics	3	0	0	3	60	15	75	40%
2	SBCACT1202	Data Base Management System	3	0	0	3	60	15	75	40%
3	SBCACP1201	Lab-1: Data Base Management System	0	0	4	2	30	20	50	40%
4	SBCAST1201	Python Programming	2	0	0	2	40	10	50	40%
5	SBCASP1201	Lab-1: Python Programming	0	0	4	2	30	20	50	40%
6	SBCACT1203	Software Engineering	3	0	0	3	60	15	75	40%
7	SBCAET1201* (Choose any one)	Professional Elective – I A. Data Science: Basics of Data Analytics using Spread sheet B. Artificial Intelligence and Machine Learning: Feature Engineering	1	0	0	1	00	25	25	40%
8	SBCAEP1201* (Any one related to above ET1201)	Lab-1 Professional Elective – I A. Data Science: Basics of Data Analytics using Spread sheet B. Artificial Intelligence and Machine Learning: Feature Engineering	0	0	4	2	30	20	50	40%
9	SBCAVA1201	Yoga/Sports/NCC/NSS/ Disaster Management	0	0	4	2	00	50	50	40%
	Total		**12**	**0**	**16**	**20**	**310**	**190**	**500**	

Note: For University Assessment (UA), College Assessment (CA) Evaluation Rules, Practical Assessment and for Question Paper Pattern refer to policy of the university

Note : * To be selected from the Proposed Streams with Discipline-Specific Electives - Data Science / Artificial Intelligence and Machine Learning / Full Stack Development proposed by AICTE / Universities as indicated at the appendix – A. However the more comprehensive list approved by the BoS of SRTMUN shall be made available with curriculum structure of Third Year and Forth Year.

*Students can choose their specialization i.e. Stream with Discipline Specific Elective [DSE] from Second year onwards.
 Indicative Appendix –A of AICTE Model syllabus available on below link
(https://www.aicte-india.org/sites/default/files/Model_Curriculum/BCA%20FINAL(2%20year%20).pdf).

Semester-IV

S. No.	Course Code	Course Title	L	T	P	Credit	UA	CA	Total	Minimum passing %
							% of Assessment			
1	SBCACT1251	Entrepreneurship and Start-up Ecosystem	1	1	0	2	40	10	50	40%
2	SBCACT1252	Computer Networks	3	0	0	3	60	15	75	40%
3	SBCACP1251	Lab-2 Computer Networks	0	0	4	2	30	20	50	40%
4	SBCACT1253	Design and Analysis of Algorithm	3	0	0	3	60	15	75	40%
5	SBCACT1254	Artificial Intelligence	3	0	0	3	60	15	75	40%
6	SBCACP1252	Lab-3 Artificial Intelligence	0	0	4	2	30	20	50	40%
7	SBCAET1251* (Choose any one)	Professional Elective – II A. Data Science: Data Visualization B. Artificial Intelligence and Machine Learning: Introduction to ML	1	0	0	1	00	25	25	40%
8	SBCAEP1251* (Any one related to above ET1251)	Lab-2 Professional Elective – II A. Data Science: Data Visualization B. Artificial Intelligence and Machine Learning: Introduction to ML	0	0	4	2	30	20	50	40%
9	SBCAST1251	Design Thinking and Innovation	1	1	0	2	00	50	50	40%
Total			**12**	**2**	**12**	**20**	**310**	**190**	**500**	

Note: For University Assessment (UA), College Assessment (CA) Evaluation Rules, Practical Assessment and for Question Paper Pattern refer to policy of the university

Note : * To be selected from the Proposed Streams with Discipline-Specific Electives - Data Science / Artificial Intelligence and Machine Learning / Full Stack Development proposed by AICTE / Universities as indicated at the appendix – A. **However the more comprehensive list approved by the BoS of SRTMUN shall be made available with curriculum structure of Third Year and Forth Year.**

Note:

- At the end of the Fourth Semester every student shall undergo Summer Training / Internship / Capstone for Eight Weeks in the industry/Research or Academic Institute. This component will be evaluated during the fifth semester.

- An **UNDER GRADUATE DIPLOMA IN COMPUTER APPLICATION** will be awarded, if a student wishes to exit at the end of Second year.

Exit Criteria after Second Year of BCA Programme:

- Students will have the option to exit the Bachelor of Computer Application (BCA) program after successfully completing the second year.

- Upon exit, they will be awarded a **UG Diploma in Computer Application**.

- To be eligible for this diploma, students must complete an additional 04 credits in one of the following areas:

    1. **Skill-Based Subject:** A specialized course aimed at enhancing technical and practical expertise in computer applications.
    2. **Work-Based Vocational Course:** A vocational course offered during the summer term, focused on building practical, industry-relevant skills.
    3. **Internship/Apprenticeship:** A professional internship or apprenticeship with a minimum duration of 08 weeks, conducted after the fourth semester, offering hands-on experience in a relevant field.
    4. **Social Responsibility & Community Engagement:** Involvement with an NGO or community-based organization for a minimum of 08 weeks, contributing to social initiatives and applying computer application knowledge to solve real-world challenges.
    5. **Capstone Project:** Completion of a capstone project integrating the skills and knowledge gained during the first two years of the program, which can be an independent or group project.

The specific mode of completing the additional credits will be decided by the **University/Admitting Body,** and students will be required to complete the 08-week program or project during the summer term following their fourth semester.

Students opting for this exit will also be required to submit an Internship/Apprenticeship Report or complete the Capstone Project as per the schedule outlined by the University/Admitting Body before they are awarded the UG Diploma.

Re-entry Criteria in to Third Year (Fifth Semester):

The student who takes an exit after second year with an award of Diploma may be allowed to re-enter into fifth Semester for completion of the BCA Program as per the University / Admitting Body schedule after earning requisite credits in the Second year.

Guidelines for the Course Assessment:

Continuous Assessment (CA) of theory and practical courses:

i. **For Theory Course:** CA shall be carried out over the entire semester. It shall be done by conducting Two Tests (Test I on 40% curriculum) and Test II (on remaining syllabus) and average of the marks scored by a student in these two tests of a particular course /paper shall be taken as the CA score.

ii. **For Practical Course:** CA shall be the marks scored by a student in the internal practical examination conducted by the concerned teacher.

iii. **For AE, MD, VA, AE, etc. courses:** CA marks are same as displayed in the structure and are given as per the policy of the university or in absence of university guidelines, as decided by the concerned teacher/ institution.

End Semester Assessment (80% of the Maximum Marks) of theory and practical courses:

Proposed Streams with Discipline-Specific Electives - Data Science / Artificial Intelligence and Machine Learning / Full Stack Development proposed by AICTE / Universities.

Note: The following is indicative. Universities/Institutes may add streams / electives as per their specific requirements. However the more comprehensive list approved by the BoS of SRTMUN shall be made available with curriculum structure of Third Year and Forth Year.

1. Data Science

Sl.No	Semester	Professional Elective
1	III	Basics of Data Analytics using Spreadsheet
2	IV	Data Visualization
3	V	Introduction to Data Science
4	V	Time Series Analysis
5	V	Machine Learning
6	VI	Big Data Analytics
7	VI	Exploratory Data Analysis
8	VII	Business Intelligence & Analytics
9	VII	Data Mining & Warehousing
10	VIII	Advanced Data Visualization
11	VIII	Cloud Computing for Data Analytics
12	VIII	Data Security & Privacy

2. Artificial Intelligence & Machine Learning

Sl.No	Semester	Professional Elective
1	III	Feature Engineering
2	IV	Introduction to ML
3	V	Neural Network
4	V	Digital Image Processing
5	V	Natural Language Processing
6	VI	Deep Learning for Computer Vision
7	VI	Predictive Analysis
8	VII	Explainable AI
9	VII	Evolutionary Algorithm
10	VIII	Speech Recognition
11	VIII	Augmented Reality & Virtual Reality
12	VIII	Security aspects of ML

A. For illustration a course / paper of 03 credits / 60 marks has been considered. The Question Paper Pattern of the ESA:

Faculty of Science and Technology
BCA
Question paper format (As per NEP2020)

Time : 3 hrs   *Max. Marks: 60*

Instructions to the candidates:
1. *Question No. 1 is Compulsory.*
2. *From Q. No. 2 to 5 solve any three questions.*
3. *Figures to the right indicate full marks.*
4. *Assume suitable data, if necessary.*
5. *Use of any electronic media such as mobile phone, digital diary, and electronic calculator is not permitted.*

Q.1 Attempt the following (any three)   **(15) Marks**
    (Based on all units)
      a)
      b)
      c)
      d)
      e)

Q. 2 Attempt of the following (any three)   **(15) Marks**
    (Based on unit 1)
      a)
      b)
      c)
      d)

Q. 3 Solve the following (any three)   **(15) Marks**
    (Based on unit 2)
      a)
      b)
      c)
      d)

Q. 4 Attempt of the following (any three)   **(15) Marks**
    (Based on unit 3)
      a)
      b)
      c)
      d)

Q. 5 Attempt of the following (any three)   **(15) Marks**
    (Based on unit 4)
      a)
      b)
      c)
      d)

******

B. **For illustration a course / paper of 02 credits / 40 marks has been considered. The Question Paper Pattern of the ESA:**

Faculty of Science and Technology
BCA
Question paper format (As per NEP-2020)

Instructions to the candidates:
1. *Question No. 1 is Compulsory.*
2. *From Q. No. 2 to 5 solve any three questions.*
3. *Figures to the right indicate full marks.*
4. *Assume suitable data, if necessary.*
5. *Use of any electronic media such as mobile phone*, *digital diary,*
    and electronic calculator is not permitted.

Q.1 Attempt the following (2 Marks each) **(10)**
   (Based on all units)
     a)
     b)
     c)
     d)
     e)

Q. 2 Attempt of the following (any two) **(10)**
   (Based on unit 1)
     a)
     b)
     c)

Q.3 Attempt of the following (any two) **(10)**
   (Based on unit 2)
     a)
     b)
     c)

Q. 4 Attempt of the following (any two) **(10)**
   (Based on unit 3)
     a)
     b)
     c)

Q. 5 Attempt of the following (any two) **(10)**
   (Based on unit 4)
     a)
     b)
     c)

*****

Detailed Syllabus

SEMESTER –III

SEMESTER –III

Probability and Statistics

SBCACT1201	Probability and Statistics	3L:0T:0P	3 Credits

Course Objectives

CO1: This course aims to make the students trained to handle randomness scientifically using theory of probability.

CO2: This course intends to make the students able to represent the statistical data in a systematic way and analyze it to draw meaningful information from them.

CO3: Through plentiful examples and exercises, this course provides the students scope to apply probabilistic and statistical techniques to deal with the real-life problems.

Course Content:

UNIT I:

Basic concepts of Statistics, qualitative and quantitative data, classification of data, construction of frequency distribution, diagrammatic representation of data.

Measures of Central Tendency: Arithmetic mean, median and mode—their properties

Measures of Dispersion: Range, mean deviation, quartile deviation, variance and standard deviation.

UNIT II:

Correlation: Definition, scatter diagram, types of correlation, measures—Karl Pearson's correlation coefficient.

Regression: Linear regression-fitting by least square method and interpretation.

UNIT III:

Concepts of probability: Permutation and Combination, Random Experiment, sample space and events, Classical definition of probability, Axioms of probability, Probability of an event, basic probability theorem, applications of probability theorem, conditional probability.

Standard Probability Distributions: Binomial probability distribution, Poisson probability distribution, Normal probability distribution.

UNIT IV:

Concept of sampling, Types of samples, Hypothesis Testing, Type I and Type II Errors.

Large Sample Test (Z Test): Mean Test, Difference between two means, difference between two standard deviations.

Small Sample Test (t Test): Mean Test, Difference between two means of independent samples, difference between two means of dependent sample.

Chi Square Test and Test of Goodness of fit.

Text Books

1. Manish Sharma, Amit Gupta, The Practice of Business Statistics, Khanna Book Publishing Company, 2010 (AICTE Recommended Textbook)

2. Das N. G., Statistical Methods, Combined Edition, Tata McGraw Hill, 2010.

3. Ross Sheldon M., Introduction to Probability and Statistics for Engineers and Scientists, 6th Edition, Elsevier, 2021.

4. Miller Irwin and Miller Marylees, Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2005

Reference Books

1. Pal Nabendu and Sarkar Sahadeb, Statistics: Concepts and Applications, Second Edition, PHI, 2013

2. Montgomery Douglas and Runger George C., Applied Statistics and Probability for Engineers, Wiley, 2016.

3. Reena Garg, Engineering Mathematics, Khanna Publishing House, 2024.

Web Resources

1. https://nptel.ac.in/courses/111106112

2. https://nptel.ac.in/courses/111105041

Database Management Systems

SBCACT1202	Database Management Systems	3L:0T:0P	3 Credits

Course Objectives

CO1: Understanding Core Concepts of DBMS

CO2: Proficiency in Database Design and SQL

CO3: Application of Advanced Database Techniques

Prerequisite: Basic knowledge of Set Theory.

Course Content:

UNIT I:

Introduction to Databases: Definition of Data, Database, and DBMS, Overview of Database Applications, Advantages and Disadvantages of DBMS, Roles of Database Users and Administrators

Data Models: Introduction to Data Models, Types of Data Models (Hierarchical, Network, Relational, Object-oriented), Importance of Data Models in DBMS

Database Design: Keys: Primary Key, Candidate Key, Super Key, Foreign Key, Composite Key, Alternate Key, Unique Key, Surrogate Key, Constraints in a table: Primary Key, Foreign Key, Unique Key, NOT NULL, CHECK, Entity-Relationship (ER) Model, Entities and Entity Sets, Attributes and Relationships, ER Diagrams, Key Constraints and Weak Entity Sets, Extended ER Features, Introduction to the Relational Model and Relational Schema

UNIT II:

Structured Query Language (SQL): SQL Basics: DDL and DML, Aggregate Functions: Min(), Max(), Sum(), Avg(), Count()), Logical operators (AND, OR, NOT), Predicates (Like, Between, Alias, Distinct), Clauses(Group By, Having, Order by, top/limit), Inner Join, Natural Join, Outer Join

UNIT III:

Normalization and Database Design: Functional Dependencies: Armstrong's Axioms, Definition, Properties (Reflexivity, Augmentation, Transitivity), Types (Trivial, Non-Trivial, Partial and Full Functional Dependency), Closure of Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF), Denormalization.
Database Storage and Indexing: Data on External Storage, File Organizations and Indexing

UNIT IV:

NoSQL Databases and Big Data: Introduction to NoSQL, Data Models: Document, Key value, Column family, Graph. Uses and Features of NO/SQL document databases. CAP theorem, BASE vs ACID, CRUD operations, MongoDB operators, Overview of Big Data Technologies: Hadoop, MongoDB, Cassandra.

Text Books

1. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", third edition, McGraw – Hill, 2018

2. Benjamin Rosenzweig, Elena Rakhimov, "Oracle PL/SQL by Example", fifth edition, Prentice Hall, 2015

3. Brad Dayley, "NoSQL with MongoDB in 24 Hours", 1st edition, Sams Publishing, 2024

Reference Books

1. Korth, Silbertz, Sudarshan," Database System Concepts", Seventh Edition, McGraw - Hill.(2019)

2. R.P. Mahapatra, Govind Verma, "Database Management Systems", Khanna Publishing House, 2025.

Web Resources

1. https://oracle-base.com/articles

2. https://forums.oracle.com/ords/apexds/domain/dev-community/category/sql_and_pl_sql

3. https://asktom.oracle.com/ords/f?p=100:1:0

SBCACP1201	Lab-1 Data Base Management System	0L:0T:4P	2 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However, the modified list must match with CO-PO mapping

Suggestive Laboratory Experiments:

1. Draw an ER Diagram of Registrar Office

2. Draw an ER Diagram of Hospital Management System

3. Reduce The ER diagram in question no 1 into tables

4. Reduce the ER diagram of question no 2 into tables

Consider the following Schema

Supplier (SID, Sname, branch, city, phone)

Part (PID, Pname, color, price)

Supplies (SID, PID, qty, date_supplied)

DDL Commands

5. Create the above tables

6. Add a new attribute state in supplier table

7. Remove attribute city from supplier table

8. Modify the data type of phone attribute

9. Change the name of attribute city to address

10. Change a table's name, supplier to sup

11. Use truncate to delete the contents of supplies table

12. Remove the part table from database

DML Commands

1. Insert at least 10 records in tables supplier, part and supplies

2. Show the contents in tables supplier, part and supplies

3. Find the name and city of all suppliers

4. Find the name and phoneno of all suppliers who stay in 'Delhi'

5. Find all distinct branches of suppliers

6. Delete the record of the supplier whose SID is 204001

7. Delete all records of supplier table

8. Delete all records of suppliers whose city starts with capital A.

9. Find the supplier names which have 'lk' in any position

10. Find the supplier name where 'R' is in the second position

11. Find the name of supplier whose name starts with 'V' and ends with 'A'

12. Change the city of all suppliers to 'BOMBAY'

13. Change the city of supplier 'Vandana' to 'Goa'

Queries with Constraints

1. Create the supplier table with Primary Key Constraint

2. Create supplies table with Foreign key Constraint

3. Create a part table with UNIQUE Constraint

4. Create supplier Table with Check Constraints

5. Create Supplier table with Default Constraint

Queries on TCL

1. Create Savepoints

2. Rollback to SavePoints

3. Use Commit to save on

Aggregate Functions:

1. Find the minimum, maximum, average and sum of costs of parts

2. Count the total number of parts present

3. Retrieve the average cost of all parts supplied by 'Mike'

Queries on GROUP BY, HAVING AND ORDER BY Clauses

1. Display total price of parts of each color

2. Find the branch and the number of suppliers in that branch for branches which have more than 2 suppliers

3. Find all parts sorted by pname in ascending order and cost in descending order

4. Find the branch and the number of suppliers in that branch

Queries on Analytical, Hierarchical, Recursive nature.

1. Find out the 5 th highest earning employee details.

2. Which department has the highest number of employees with a salary above $80,000, and what percentage of employees in that department have a salary above $80,000

3. Retrieve employee table details using the hierarchy query and display that hierarchy path starting from the top level indicating if it is a leaf and there exists a cycle.

4. What is the average salary for employees in the top 2 departments with the highest average salary, and what is the hierarchy of departments and sub-departments for these top 2 departments?

5. Use recursion to retrieve the employee table and display the result in breadth first and depth first order.

6. Write a recursive query to show the equivalent of level, connect_by_root and connect_by_path

7. Use recursion to retrieve the employee table and display the result in depth first order showing id, parent_id, level, root_id, path and leaf.

Queries on Operators

1. Find the pname, phoneno and cost of parts which have cost equal to or greater than 200 and less than or equal to 600.

2. Find the sname , SID and branch of suppliers who are in 'local' branch or 'global' branch

3. Find the pname, phoneno and cost of parts for which cost is between 200 and 600 Model

4. Find the pname and color of parts, which has the word 'NET' anywhere in its pname.

5. Find the PID and pname of parts with pname either 'NUT' or 'BOLT'

6. List the suppliers who supplied parts on '1 st may2000', '12 JAN 2021','17 dec 2000' ,'10 Jan 2021'

7. Find all the distinct costs of parts

Join Operators

1. Perform Inner join on two tables

2. Perform Natural Join on two tables

3. Perform Left Outer Join on tables

4. Perform Right Outer join on tables

5. Perform Full Outer Join on tables

PL/SQL Programs

1. Write a PL/SQL Code to add two numbers

2. Write a PL/SQL code for Fibonacci series

3. Write a PL/SQL Code for greatest of 3 numbers

4. Write a PL/SQL code for area and circumference of a circle

PL/SQL Programs on Cursors

1. Write a Program using CURSOR to display SID and city of 1 st   record of

supplier

2. Write a program using cursors to display the SID and City of all suppliers and then print

the count of suppliers.

PL/SQL Programs on Triggers, Procedures and Functions

1. Write a Program using TRIGGER on UPDATE Model curriculum for UG Degree in BCA

2. Write a command to See the effect of trigger

3. Write a Program using PROCEDURE to increase the cost by Rs.1000 for part whose

PID is passed as an argument.

4. Write a procedure to update the city of an supplier whose SID and city are passed as

arguments and the procedure returns the name of supplier whose city is updated.

5. Write a function to return the total number of suppliers

6. Write a function to return the PID of part, for which the part name is passed

7. Write a function to find the sum total of costs of all parts.

PL/SQL Programs on Implicit Cursors

1. Insert a record using %ROWTYPE

2. Write a code using %NOTFOUND, %FOUND, %ROWCOUNT

3. Write a code using %TYPE

MongoDB Queries

1. Create a collection and insert documents into it using insertOne() and insertMany()

2. Select all documents in collection

3. Find the count of all suppliers

4. Find all records that have city = 'Delhi'

5. Retrieve all documents that have color equal to 'red' or 'green'

6. Retrieve all documents where part_name is 'P1' or price is less than 200.

7. Update the record of 'Geeta', set city = 'Bombay' and phoneno = '11223344'

8. Delete all records where price is greater than 5000

9. Display only the name and city of the supplier

10. Sort all suppliers on city and display only the first two records.

Python Programming

SBCAST1201	**Python Programming**	**2L:0T:0P**	**2 Credits**

Course Objectives

CO1: Develop modular Python programs.

CO2: Apply suitable Python programming constructs, built-in data structures using Python libraries to solve a problem.

CO3: Understand basic Data visualization and File handling in Python.

Prerequisites:

Understanding of Problem-solving techniques using a programming language and basic data structures.

Course Content:

UNIT I:

Introduction: History and Application areas of Python; Structure of Python Program; Identifiers and Keywords; Operators and Precedence; Basic Data Types and type conversion; Statements and expressions; Input/Output statements.

Strings: Creating and Storing Strings, Built-in functions for strings; string operators, String slicing and joining; Formatting Strings.

UNIT II:

Control Flow Statements: Conditional Flow statements; Loop Control Statements; Nested control Flow; continue and break statements, continue, Pass and exit.

Functions: Built-In Functions, Function Definition and call; Scope and Lifetime of Variables, Default Parameters, Command Line Arguments; Lambda Functions; Assert statement; Importing User defined module;

UNIT III:

Mutable and Immutable objects: Lists, Tuples and Dictionaries; Commonly used Functions on Lists, Tuples and Dictionaries. Passing Lists, tuples and Dictionaries as arguments to functions Using Math and Numpy module for list of integers and arrays.

UNIT IV:

Files: Types of Files; Creating, Reading and writing on Text and Binary Files; The Pickle Module, Reading and Writing CSV Files. Reading and writing of csv and JSON files.

Exception Handling: Try-except-else-finally block, raise statement, hierarchy of exceptions,

adding exceptions.

Data visualization: Plotting various 2D and 3D graphics; Histogram; Pi charts; Sine and cosine curves.

Text Books:

1. Venkatesh, Nagaraju Y, Introduction to Python Programming, Khanna Publishing House, 2021.

2. Jeeva Jose, Introduction to Computing & Problem Solving With PYTHON, Khanna

Publishing House, 2023.

3. Sheetal Taneja & Naveen kumar: Python Programming a Modular approach – A Modular approach with Graphics, Database, Mobile and Web applications, Pearson, 2017.

Reference Books:

1. Think Python, by Allen Downey, 2nd edition, 2015, O'Reilly.

https://drive.google.com/file/d/1p9Pul6d5UvnQrO9-Q-LE2_p4YvMk5cIg/view

2. An introduction to Python for absolute beginners, by Bob Dowling, Cambridge Univ.

3. Introduction to Computation and Programming using Python, by John Guttag, 2 nd edition,

2016, PHI India.

Web Resources:

1. https://www.learnpython.org/

2. https://www.w3schools.com/python/default.asp

SBCASP1201	**Lab-1 Python Programming**	**0L:0T:4P**	**2 Credits**

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However, the modified list must match with CO-PO mapping.

Suggestive Laboratory Experiments:

1. Write a program to find whether a number is a prime number.

2. Write a program to print m raise to power n, where m and n are read from the user.

3. Write a program having a parameterised function that returns True or False depending on whether the parameter passed is even or odd.

4. Write a program to print the summation of the following series upto n terms:1-2+3-4+5+6+7 - - +n

5. Write a menu driven program to perform the following operations on strings using string built in functions.

       a)   Find the frequency of a character in a string.

       b)   Replace a character by another character in a string.

       c)   Remove the first occurrence of a character from a string.

       d)   Remove all occurrences of a character from a string.

6. Write a program that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string, then it should return -1

7. Using Numpy module write menu driven program to do following

       a)   Create an array filled with 1's.

       b)   Find maximum and minimum values from an array

       c)   Dot product of 2 arrays.

       d)   Reshape a 1-D array to 2-D array.

8. Write a function that takes a sentence as input from the user and calculates the frequency of each letter. Use a variable of dictionary type to maintain the count.

9. Consider a tuple t1=(1,2,5,7,9,2,4,6,8,10). Write a program to perform following operations:

       a)   Print contents of t1 in 2 separate lines such that half values come on one line and other half in the next line.

       b)   Print all even values of t1 as another tuple t2.

       c)   Concatenate a tuple t2=(11,13,15) witht1.

       d)   Return maximum and minimum value from t1..

10. Write a function that reads a file file1 and copies only alternative lines to another file file2. Alternative lines copied should be the odd numbered lines.

11. Write a Python program to handle a ZeroDivisionError exception when dividing a number by zero.

12. Write a program that reads a list of integers from the user and throws an exception if any numbers are duplicates.

13. Write a program that makes use of a function to display sine, cosine, polynomial and exponential curves.

14. Take as input in the months and profits made by a company ABC over a year. Represent this data using a line plot. Generated line plot must include X axis label name = Month   Number and Y axis label name = Total profit.

Software Engineering

SBCACT1203	Software Engineering	3L:0T:0P	3 Credits

Course Objectives

CO1: To Acquire a comprehensive understanding of the software development lifecycle and its application in contemporary software engineering practices.

CO2: To Develop proficiency in project management methodologies and strategic decision-making for successful software project execution.

CO3: To Master the art of software design, development, and testing to produce robust and efficient software solutions.

Prerequisites: Basic understanding of Software, Applications, Programming fundamentals.

Course Content:

UNIT I:

The evolving role of software, changing nature of software, layered technology, a process framework, Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

Agile software development: Agility Principles, Agile methods

UNIT II:

Software Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

Project planning- Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques.

UNIT III:

Design: Design process and design quality, design concepts, the design model, software architecture, data design, architectural design, Basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

UNIT IV:

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability.

Release Management: Release planning, development and build plans, release strategies, risk Management.

Text Books

1. Software Engineering, N.S. Gill, Khanna Publishing House, 2023 (AICTE Recommended Textbook)

2. Software Engineering, Ian Somerville, 9th edition, Pearson education.

3. Software Engineering A Practitioner's Approach, 8th edition, Roger S Pressman, Bruce R. Maxim. McGraw Hill Education, 2015.

Reference Books

1. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007

2. Software Engineering: Principles and Practice Hans van Vliet

Professional Elective -I

Professional Elective -I	1L:0T:4P	3 Credits

(Data Science / Artificial Intelligence and Machine Learning)		

Data Science

SBCAET1201	Basics of Data Analytics using Spreadsheet	1L:0T:0P	1 Credits

Course Objectives

CO1: Understand the basics of data analytics and its applications.

CO2: Develop proficiency in using spreadsheet software for data manipulation and analysis.

CO3: Build and use spreadsheet models for decision making & Communicate data insights effectively

Prerequisite: Knowledge on basics of mathematical & Statistical concepts such as arithmetic, percentages, averages, and basic algebra.

Course Content:

UNIT I: Introduction to Data Analytics

Understanding data and its types (structured, unstructured, semi-structured)-What is Data Analytics-Types of data Analytics-Importance of Data Analytics- Applications of Data Analytics.

UNIT II: Data, Ethics, and Industry: Case Studies

Data Collection Methods - Different Data Sources & format - Data Cleaning and Transformation - Handling Missing Data and Outliers. - Ethical considerations in data analytics. - Real-world Applications of Data Analytics- Industry-specific applications (finance, marketing, operations) - Case Study

Note: Case study is for discussion not to be considered for evaluation.

Text Books

1. "Beginner's Guide for Data Analysis using R Programming" by Jeeva Jose, Khanna Publishing House, 2024.

2. "Data Analytics" by V.K. Jain, Khanna Book Publishing Company, 2024.

3. "Excel Data Analysis for Dummies" by Stephen L. Nelson and E. C. Nelson, John Wiley & Sons; 3rd edition, 2016

4. "Data Analysis Using Microsoft Excel" by Michael R. Middleton, Thomson, Brooks/Cole, 3rd edition, 2004

Reference Books

1. "Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach, John Wiley & Sons, 25 Sept 2018

2. "Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics" by Cliff T Ragsdale, Cegage learning asia pet. 2015

3. "Mastering Excel" by WebTech Solutions, Khanna Publishing House, 2024.

SBCAEP1201	**Lab- Basics of Data Analytics using Spreadsheet**	**0L:0T:4P**	**2 Credits**

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However, the modified list must match with CO-PO mapping.

PART – A: Understanding and Describing the Data

Introduction to Excel and Basic Functions

1. Getting started with Excel: Workbook, Worksheet, Cells, and Ranges

2. Data entry and basic formatting techniques

3. Using basic arithmetic functions: SUM, AVERAGE, MIN, MAX, ROUND

4. Introduction to cell referencing: relative, absolute, and mixed

Data Importing and Pre-processing

1. Importing data from various sources (CSV, text files, web data)

2. Data cleaning: removing duplicates, handling missing data, and standardizing formats

3. Data transformation: text-to-columns, data validation techniques

4. Using the "Find & Replace" and "Text Functions" (LEFT, RIGHT, MID, CONCATENATE)

Descriptive Statistics Using Excel

1. Calculating measures of central tendency: mean, median, mode

2. Computing measures of dispersion: range, variance, standard deviation

3. Creating and interpreting frequency distributions and histograms

4. Using Excel's "Data Analysis Toolpak" for basic statistical analysis

PART- B: Beyond the Basics: Visualizing and Communicating Data

Advanced Spreadsheet Functions

1. Using logical functions: IF, AND, OR, IFERROR

2. Lookup and reference functions: VLOOKUP, HLOOKUP, INDEX, MATCH

3. Data aggregation techniques: SUMIFS, COUNTIFS, AVERAGEIFS

4. Text functions for data manipulation: TRIM, CLEAN, TEXT, RIGHT, LRFT, MID

Data Visualization Techniques

1. Creating various chart types: bar, line, pie, scatter

2. Advanced charting techniques: combo charts, dual-axis charts

3. Data visualization best practices: choosing the right chart, formatting, and styling

4. Creating and customizing PivotTables and Pivot Charts

 Dashboard Creation

1. Introduction to dashboards: concepts and components

2. Using PivotTables and Pivot Charts for dashboard elements

3. Applying conditional formatting for dynamic visual cues

4. Creating interactive dashboards with slicers and timeline

Artificial Intelligence & Machine Learning

SBCAET1201	Feature Engineering	1L:0T:0P	1 Credits

Course Outcomes

CO1: Understand the importance of features in machine learning and differentiate between various types of data and features (structured vs. unstructured, categorical, numerical, text, and date-time).

CO2: Apply basic feature preprocessing techniques such as handling missing data, data cleaning, and feature scaling and normalization.

CO3: Implement feature engineering techniques for numerical data, including binning, discretization, polynomial and interaction features, and log transformation.

CO4: Utilize categorical data techniques, such as one-hot encoding and label encoding, and understand feature selection methods, including filter and wrapper methods.

CO5: Perform feature transformation using techniques like Principal Component Analysis (PCA) and understand its application in machine learning.

Prerequisite:

Basic knowledge of data analytics/machine learning and familiarity with any programming language.

Course Content:

UNIT I: Introduction to Feature Engineering

Introduction to Data and Features: Importance of Features in Machine Learning. Data types and features: Numerical, Categorical, Ordinal, Discrete, Continuous, Interval and Ratio. Basic Feature Preprocessing: Handling Missing Data, Data Cleaning, Feature Scaling, Normalization, and Transformation.

UNIT II: Feature Engineering Techniques

Techniques for Numerical Data: Binning and Discretization, Polynomial and Interaction Features. Categorical Data Techniques: One Hot Encoding, Label Encoding. Feature extraction vs. feature selection, Steps in feature selection. Feature Selection Methods: Filter, Wrapper, and Hybrid. Feature Reduction: Introduction and application of Principal Components Analysis.

Text Books

1. M.C. Trivedi, Data Science and Data Analytics Using Python Programming, Khanna Publishing House, 2024.

2. Zheng, Alice, & Casari, Amanda. (2018). Feature engineering for machine learning: Principles and techniques for data scientists. O'Reilly Media, Inc.

3. Kalita, J. K., Bhattacharyya, D. K., & Roy, S. (2023). Fundamentals of Data Science: Theory and Practice. Elsevier. ISBN-13: 9780323917780.

Reference Books

1. Duda, R. O., Hart, P. E., Stork, D (2007). Pattern classification (2Ed), John Wiley & Sons, ISBN-13: 978-8126511167.

2. N. Bhaskar, Vasundhara, Machine Learning, Khanna Publishing House, 2024.

3. M.C. Trivedi, Deep Learning and Neural Network_MC Trivedi, Khanna Publishing House, 2024.

4. Ng, Andrew. (2018). Machine learning yearning (Draft, MIT Licensed). GitHub. ISBN-10: 199957950X, ISBN-13: 978-1999579500.

5. Han, Jiawei, Kamber, Micheline, & Pei, Jian. (2011). Data mining: Concepts and techniques (3rd ed.). Morgan Kaufmann Publishers. ISBN 978-0123814791.

6. Tan, Pang-Ning, Steinbach, Michael, Karpatne, Anuj, & Kumar, Vipin. (2021). Introduction to data mining (2nd ed.). Pearson. ISBN 978-9354491047.

7. Provost, Foster, & Fawcett, Tom. (2013). Data science for business: What you need to know about data mining and data-analytic thinking. O'Reilly Media, Inc.

8. Galli, Soledad. (2020). Python feature engineering cookbook: Over 70 recipes for creating, engineering and transforming features to build machine learning models. Packt Publishing, Limited.

9. Nielsen, Aileen. (2019). Practical time series analysis: Prediction with statistics and machine learning. O'Reilly Media.

10. Rajiv Chopra, Deep Learning, Khanna Publishing House, 2024.

11. Jeeva Jose, Machine Learning, Khanna Publishing House, 2024.

12. Chollet, François. (2017). Deep learning with Python. Manning Publications. ISBN 9781617294433.

SBCAMD1101	Lab: Feature Engineering	0L:0T:4P	2 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However, the modified list must match with CO-PO mapping.

Prerequisite: Knowledge of Python Programming language

LAB Experiments

The lab experiments can be implemented in Python using relevant libraries such as numpy pandas, sklearn,nltk, matplotlib, and seaborn. Kaggle datasets, public repositories (e.g., UCI, Machine Learning etc.), or generated datasets can be used for conducting the experiments. Experiments may be conducted on numerical, image, or time-series datasets.

Suggested list of Experiments (not limited to):

1. Handle missing values in column(s) of a dataset. For example, fill missing values with the mean/median/mode of the columns such as 'Age', 'Height', 'Weight', 'Grade' for a dataset.

2. Clean a dataset by identifying and removing invalid data entries. For example, a dataset having columns 'Name', 'Gender' and 'Age' where 'Name' contains 'invalid data'.

3. Scale numerical features using Min-Max normalization for a dataset with columns like 'Height', 'Weight'.

4. Perform exploratory data analysis and visualize data distributions using histograms and boxplots.

5. Compute and visualize the correlation matrix of a dataset with 2 or more columns.

6. Bin numerical data into discrete intervals for a dataset with a column containing numerical values.

7. Create polynomial and interaction features from numerical data in a dataset with two columns.

8. Apply logarithmic transformation to skewed numerical features in a dataset with column 'Distance'.

9. Perform one-hot encoding on categorical features in a dataset with column 'Category' containing categorical values. The distinct values in the Category feature are [Good, Better, Best] and Gender [Male, Female].

10. Preprocess text data (tokenization) for a dataset with a column 'Text'.

11. Preprocess text data (stemming) for a dataset with a column 'Text'.

12. Preprocess text data (lemmatization) for a dataset with a column 'Text'.

13. Convert text data into a Bag-of-Words representation for a dataset with a column 'Text'.

14. Apply TF-IDF transformation to text data for a column 'Text'.

15. Perform image augmentation (resizing, normalization, rotation, translation) for a set of images.

16. Perform image augmentation resizing for a set of images.

17. Perform image augmentation normalization for a set of images.

18. Perform image augmentation rotation for a set of images.

19. Perform image augmentation translation for a set of images.

20. Decompose a time series into trend, seasonal, and residual components for a dataset with a column 'TimeSeries'.

21. Perform Principal Component Analysis (PCA) on a dataset and visualize the first two principal components.

SBCAVA1201	Yoga and Physical fitness /Sports/NCC/NSS/Disaster Management	0L:0T:4P	2 Credits

Note: All the theoretical contents shall be delivered through the practical workshop mode only. No class room teaching is encouraged in this course.

YOGA

Yoga course is designed to provide students with a comprehensive understanding of physical fitness, wellness, and nutrition. This course explores the meaning and importance of yoga in the modern era, the role of sports in maintaining physical fitness, and the various components of physical wellness. Students will also learn about the significance of nutrition and weight management, equipping them with the knowledge to promote a healthy and balanced lifestyle.

Through this course, students will gain insights into the holistic approach to health and well-being.

Course Objective(s):

i. Understand yoga's significance and its practical applications for holistic well-being.

ii. Explore subtle energy systems and their role in enhancing health through yogic practices.

iii. Examine various paths of yoga to foster self-realization and spiritual growth.

iv. Master the Eight Limbs of Yoga for physical, mental, and spiritual harmony.

v. Apply yogic principles to manage psycho-somatic ailments and promote resilience.

Course Content:

Unit-1

● Yoga: Meaning and definition

● Importance of yoga in 21st century

● Introduction to Yogic Anatomy and Physiology

● Yoga & sports, Yoga for healthy lifestyle

● Types of Yoga: - Hatha yaga, laya yoga, mantra yoga, bhakti yoga, karma yoga, jnana yoga, raj yoga

● Study of Chakras, Koshas, Pranas, Nadis, Gunas, Vayus and its application in Yogic practices.

● Ashtang Yoga: - Yama, niyama, asana, pranayama, Pratyahar, dharna, dhyan, Samadhi; Benefits, Utilities & their psychological impact on body and mind. According to yoga concept of normality in modern psychology, concept of personality & its development, yogic management of psycho-somatic ailments: frustration, anxiety, depression

Unit- 2

● Sports for Physical Fitness: Meaning and definition

● Physical Activity – Concept, Benefits of Participation in Physical Activities

● Components and Significance of Physical Fitness -Health, Skill and Cosmetic Fitness

● Types of Physical Activities – Walking, Jogging, Running, Calisthenics, Rope Skipping, Cycling, Swimming, Circuit Training, Weight training, Adventure Sports

● Principles of Physical Fitness, Warming Up, Conditioning, Cooling Down, Methods to Develop and Measure Health and Skill related components of Physical Fitness

● Measurement of Health Related Physical Fitness (HRPF)

Unit -3

● Physical Wellness: Concept, Components

● Types of wellness: psychological, social, emotional, and spiritual.

● Significance with reference to Positive Lifestyle 2.2

● Concepts of Quality of Life and Body Image

● Factors affecting Wellness

● Wellness Programmes

Unit-4: Nutrition and Weight Management

● Concept of Nutrients, Nutrition, Balanced Diet, Dietary Aids and Gimmicks

● Energy and Activity- Calorie Intake, Energy Balance Equation

● Obesity - Concept, Causes, Obesity Related Health Problems

● Weight Management through Behavioural Modifications

Text Books / References:

● Anand O P. Yog Dawra Kaya Kalp. Sewasth Sahitya Perkashan. Kanpur.

● Brown, J.E. Nutrition Now Thomson-Wadsworth.

● Corbin et.al.Fitness & Wellness-Concepts. McGraw Hill. Publishers. New York.U.S.A

● Corbin, C. B., G. J. Welk, W. R Corbin, K. A. Welk, Concepts of Physical Fitness: Active Lifestyle for Wellness. McGraw Hill, New York, USA.

● Hoeger, W W K and S.A. Hoeger. Principles and Labs for Fitness and Wellness, Thomson Wadsworth, California, USA.

● Hoeger, W.W. & S. Hoeger   Fitness and Wellness. 7th Ed. Thomson Wadsworth, Boston, USA.

● Kamlesh, M. L. & Singh, M. K.) Physical Education (Naveen Publications).

● Kansal, D.K. Text book of Applied Measurement, Evaluation & Sports Selection. Sports & Spiritual Science Publications, New Delhi.

● Kumari, Sheela, S., Rana, Amita, and Kaushik, Seema,, Fitness, Aerobics and Gym Operations, Khel Sahitya, New Delhi

● Lumpkin, A. Introduction to Physical Education, Exercise Science and Sports Studies, McGraw Hill, New York, U.S.A.

● Sarin N) Yoga Dawara Rogon Ka Upchhar.Khel Sahitya Kendra

● Savard, M. and C. Svec The Body Shape Solution to Weight Loss and Wellness: The Apples & Pears Approach to Losing Weight, Living Longer, and Feeling Healthier. Atria Books, Sydney, Australia.

● Siedentop, D. Introduction to Physical Education, Fitness and Sport, McGraw Hill Companies Inc., New York, USA.

● Sri Swami Ramas. Breathing. Sadhana Mandir Trust.Rishikesh.

● Swami Ram Yoga & Married Life Sadhana Mandir Trust. Rishikesh

Course Outcome(s):

i. Gain a comprehensive understanding of yoga and its modern applications for holistic well-being.

ii. Demonstrate proficiency in yogic anatomy and physiology, enhancing yoga practice and promoting physical and energetic balance.

iii. Master the Eight Limbs of Yoga and comprehend their psychological impact, fostering personal growth and self-realization.

iv. Integrate yoga principles into sports and physical fitness activities to enhance performance and prevent injuries.

v. Develop skills in wellness management and nutrition

Sports Management

Sports Management course is designed to provide undergraduate students with a broad, foundational understanding of the dynamic field of sports management. This course will familiarize students with the fundamental principles and concepts of sports management, including its scope, organizational structure, and ethical considerations. Students will gain insights into the roles of marketing and sponsorship in the sports industry, as well as develop proficiency in financial management techniques

specific to sports organizations. Additionally, the course will explore the application of analytics and technology in sports, enhancing the strategic decision-making and fan engagement capabilities.

Course Objective(s):

i. Understand the fundamental principles and concepts of sports management, including its scope, organizational structure, and ethical considerations.

ii. Analyse the role of marketing and sponsorship in the sports industry, with a focus on branding, target audience segmentation, and event management.

iii. Develop proficiency in financial management techniques specific to the sports industry, including revenue generation, cost management, and investment strategies.

iv. Explore the application of analytics and technology in sports, including performance evaluation, strategic decision-making, and fan engagement.

v. Apply theoretical knowledge to practical scenarios through case studies and projects, fostering critical thinking and problem-solving skills in sports management contexts.

Course Content:

Unit 1: Introduction to Sports Management

● Definition and scope of sports management

● Significance of sports management in society and its evolution over time

● Organizational structure of sports: amateur, professional, and non-profit entities

● Roles and responsibilities of key personnel: managers, coaches, and agents

● Governance bodies in sports: FIFA, IOC, and NCAA

● Legal issues: contracts, negotiations, intellectual property rights

● Ethical considerations: fair play and doping

Unit 2: Sports Marketing and Sponsorship

● Unique aspects of sports marketing

● Fan engagement strategies

● Target audience identification and segmentation

● Branding strategies for sports teams and athletes

● Sponsorship and endorsement deals

- Negotiating and managing partnerships

- Event management: planning, organizing, and promoting sports events

Unit 3: Financial Management in Sports

- Revenue generation in sports: ticket sales, broadcasting rights, merchandise sales

- Financial models: budgeting and forecasting

- Cost management: player salaries, facility expenses, operational costs

- Investment opportunities in sports

- Risk management techniques specific to sports organizations

Unit 4: Sports Analytics and Technology

- Introduction to sports analytics

- Evaluating player performance

- Devising game strategies

- Fan engagement through technology

- Analytical techniques: statistical analysis, data visualization, predictive modeling

- Key performance indicators (KPIs) in sports

- Applications of analytics: talent scouting, injury prevention, performance optimization.

Text Books :

1. Pedersen, P. M., Thibault, L., & Pedersen, P. M. (2019). Contemporary Sport Management. Human Kinetics.

2. Hoye, R., Smith, A. C. T., Nicholson, M., et al. (2021). Sports Management: Principles and Applications. Routledge.

3. Chelladurai, P., & Kerwin, S. (2017). Introduction to Sport Management: Theory and Practice. Human Kinetics.

4. Hoye, R., Cuskelly, G., & Nicholson, M. (2019). Sports Governance: A Guide for Sport Organizations. Routledge.

5. Conrad, M. (2018). The Business of Sports: A Primer for Journalists. Routledge.

6. Shank, M. D. (2019). Sports Marketing: A Strategic Perspective. Pearson.

7. Collett, P., & Fenton, W. (2019). The Sponsorship Handbook: Essential Tools, Tips and Techniques for Sponsors and Sponsorship Seekers. Kogan Page.

8. Fullerton, S. Jr., & Funk, D. C. (2019). Sports Marketing: A Practical Approach. Routledge.

9. Conrad, M. (2019). Winning in Sports Business: Essential Marketing, Finance, and Management Strategies. Routledge.

10. McCarty, L. A., & McPherson, G. (2019). Sports Event Management: The Caribbean Experience. Routledge.

11. Brown, M. T., Rascher, D., & Leeds, M. A. (2017). Financial Management in the Sport Industry. Routledge.

12. Winfree, J. A., & Rosentraub, M. S. (2017). Sports Finance and Management: Real Estate, Entertainment, and the Remaking of the Business. Taylor & Francis.

13. Foster, G., O'Reilly, N., & Cuskelly, G. (2018). Sports Business Management: Decision Making Around the Globe. Routledge.

14. Brown, M. T., & Shick, D. M. (2019). Financial Management in the Sport Industry. Routledge.

15. Conrad, M. (2018). The Business of Sports: A Primer for Journalists. Routledge.

16. Alamar, B. C. (2013). Sports Analytics: A Guide for Coaches, Managers, and Other Decision Makers. Columbia University Press.

17. Miller, T. W. (2019). Sports Analytics and Data Science: Winning the Game with Methods and Models. FT Press.

18. Marchi, M., Albert, J., & Baumer, B. (2014). Analyzing Baseball Data with R. Chapman and Hall/CRC.

19. Schumaker, R. P., Hwang, R. S. Y., & Chen, H. (2016). Sports Data Mining. Routledge.

20. Alamar, B. C. (2013). Sports Analytics: A Guide for Coaches, Managers, and Other Decision Makers. Columbia University Press.

Course Outcome(s):

i. Demonstrate a comprehensive understanding of sports management principles, including organizational structures, legal issues, and ethical considerations.

ii. Evaluate marketing strategies and sponsorship opportunities in the sports industry, devising effective branding and promotional campaigns.

iii. Apply financial management techniques to analyze revenue streams, control costs, and make informed investment decisions in sports organizations.

iv. Utilize sports analytics tools and technology to enhance performance evaluation, strategic planning, and fan engagement initiatives.

v. Synthesize course concepts through practical applications, demonstrating the ability to address real-world challenges in sports management scenarios.

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National Cadet Corps (NCC)

This course develops essential skills in discipline, leadership, and tactical operations through structured curriculum and practical exercises. It emphasizes the role of drills in fostering discipline, leadership, and teamwork, and includes comprehensive weapon handling training with a focus on safety protocols. The

course teaches map reading, understanding topographical features, and navigating diverse terrains. Practical units cover the history and objectives of the National Cadet Corps (NCC), various maneuvers, parade formations, saluting protocols, and field and battlecraft techniques. By the end learners will master discipline, leadership, weapon handling, and tactical decision-making, effectively utilizing terrain features for strategic advantages.

Course Objective(s):

1. Understand the foundational role of drill in fostering discipline and leadership within a group, enabling effective command towards achieving common goals.

2. Appreciate the importance of grace and dignity in executing foot drill movements, recognizing their significance in enhancing performance and teamwork.

3. Comprehend the criticality of weapon handling and detailed safety measures, emphasizing the importance of accident prevention through strict adherence to safety protocols.

4. Develop an awareness of diverse terrain types and their strategic significance in battle craft, enabling informed decision-making and effective utilization of terrain features for tactical advantage.

Course Content (Practical):

Unit 1:

Overview of NCC, its history, aims, objectives, and organizational structure, Incentives and duties associated with NCC cadetship; Maneuvers: Foot drill, Word of Command, Attention, and stand at ease, and Advanced maneuvers like turning and sizing; Parade formations: Parade line, open line, and closed line; Saluting protocols, parade conclusion, and dismissal procedures. Marching styles: style march, double time march, and slow march

Unit 2:

Weapon Training, Handling firearms, Introduction and characteristics of the .22 rifle; Handling Firearm techniques, emphasizing safety protocols and Best practices.

Unit 3:

Map Reading (MR): Topographical forms and technical terms, including relief, contours, and gradients, crucial for understanding terrain features; Cardinal points , magnetic variation and grid convergence

Unit 4:

Field Craft & Battle Craft (FC & BC): Fundamental principles and techniques essential for effective field and battle craft operations; Methods of judging distance, including estimation, pacing, and visual cues

References:

● DGNCC Cadet's Hand Book - Common Subjects -All Wings

● Tiwari, R. (2019). NCC: Grooming Feeling of National Integration, Leadership and Discipline among Youth. Edwin Incorporation.

● Chhetri, R.S. (2010). Grooming Tomorrows Leaders, The National Cadet Corps.

● Directorate General National Cadet Corps (2003). National Cadet Corps, Youth in Action.

● Vanshpal, Ravi (2024). The NCC Days, Notion Press.

Course Outcome(s):

1. Mastery of Discipline and Leadership through Drill Learners would demonstrate the ability to effectively command a group, foster discipline, and work collaboratively towards achieving shared objectives.

2. Mastery of Grace and Dignity in Foot Drill Performance Learners would demonstrate an understanding of how these qualities enhance performance and foster teamwork within a group setting.

3. Proficient Weapon Handling and Safety Adherence Learners would showcase a thorough understanding of the criticality of safety measures, emphasizing accident prevention through strict adherence to safety protocols.

4. Enhanced Tactical Awareness and Strategic Decision-Making Learners would gain the ability to make informed decisions and effectively utilize terrain features to gain tactical advantage during operations.

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National Service Scheme (NSS)

This course provides students with an in-depth understanding of the National Service Scheme (NSS), including its history, philosophy, aims, objectives, and organizational structure. It equips students with knowledge about various NSS programmes and activities, emphasizing their relevance and importance. The course also develops skills in community mobilization, teaching students effective techniques for engaging and mobilizing community stakeholders.

Additionally, it cultivates an appreciation for volunteerism and shramdan (voluntary labor), highlighting their role in community development initiatives. By the end of the course, students will have comprehensive

understanding of NSS, enhanced leadership and team-building skills, and a strong sense of social awareness and patriotism.

Course Objective(s):

1. To provide students with an understanding of the history, philosophy, and basic concepts of the National Service Scheme (NSS).

2. To familiarize students with the aims, objectives, and organizational structure of NSS.

3. To equip students with knowledge about NSS programmes, activities, and their relevance.

4. To develop an understanding of community mobilization techniques and their importance in NSS activities.

5. To cultivate an appreciation for volunteerism, shramdan (voluntary labor), and their role in community development initiatives.

Course Content:

Unit 1: Introduction and Basic Concepts of NSS

National Service Scheme (NSS) - history, philosophy, and fundamental concepts, aims and objectives, providing clarity on the organization's overarching goals. Symbols of NSS - Emblem, flag, motto, song, and badge; Organizational structure of NSS

Unit 2: NSS Programmes and Activities

Diverse programmes and activities conducted under the aegis of the National Service Scheme (NSS); Significance of commemorating important days recognized by the United Nations, Centre, State Government, and University; Examination of the methodology for adopting villages/slums and conducting surveys; Financial patterns of the NSS scheme

Unit 3: Community Mobilization

Dynamics of community mobilization within the framework of the National Service Scheme (NSS); Functioning of community stakeholders; The conceptual lens of community development

Unit 4: Volunteerism and Shramdan in the Indian Context: Roles and Motivations within the NSS Framework

Ethos of volunteerism and shramdan (voluntary labor) within the cultural context of India and the framework of the National Service Scheme (NSS); Motivations and constraints shaping volunteer engagement; Role of NSS volunteers in initiatives such as the Swatch Bharat Abhiyan and Digital India

References:

1. Ministry of Youth Affairs and Sports, Government of India. (2022). National Service Scheme (NSS) Manual.

2. Agarwalla, S. (2021). NSS and Youth Development. Mahaveer Publications

3. Bhattacharya, P. (2024). Stories Of NSS (English Version). Sahityasree.

4. Borah, R. and Borkakoty, B. (2022). NSS in Socioeconomic Development. Unika Prakashan.

5. Wondimu, H., & Admas, G. (2024). The motivation and engagement of student volunteers in volunteerism at the University of Gondar. Discover Global Society, 2(1), 1-16.

6. Saha, A. K. (2002). Extension Education–The Third Dimension Needs and Aspirations of Indian Youth. Journal of Social Sciences, 6(3), 209-214.

7. Mills, S. (2013). "An instruction in good citizenship": scouting and the historical geographies of citizenship education. Transactions of the Institute of British Geographers, 38(1), 120–134. http://www.jstor.org/stable/24582445

8. Mishra, S. K., Sachdev, S., Marwaha, N., & Avasthi, A. (2016). Study of knowledge and attitude among college-going students toward voluntary blood donation from north India. Journal of blood medicine, 19-26.

9. Mukherji, B. (2007). Community Development in India. Orient Longmans.

10. History Background of NSS and its Philosophy, Aims and Objectives

11.https://www.osmania.ac.in/NSS%20URL/9.%20%20Historical%20Background%20of%20NSS%20an d%20its%20Philosophy,%20Aim.pdf

12. In Defence of Nationalism https://www.mkgandhi.org/indiadreams/chap03.htm

13. Unlocking Youth Potential for Nation Building: Strengthening NYKS and NSS

14. https://www.undp.org/india/projects/strenghtening-nyks-and-nss

Course Outcome(s):

1. Students will demonstrate an understanding of the history, philosophy, and objectives of the National Service Scheme (NSS), thereby fostering increased social awareness and patriotism among them.

2. Students will be able to organize and conduct various NSS programmes and activities effectively and through it understand the importance of leadership and team building.

3. Students will develop skills in community mobilization and partnership building.

4. Students will appreciate the importance of volunteerism and shramdan in societal development and thus, be able to understand role of community participation.

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DISASTER MANAGEMENT

In our rapidly evolving 21st-century world, challenges emerge in diverse forms, transcending borders and intertwining economic, societal, and environmental realms. These challenges profoundly affect vulnerable communities, magnifying their susceptibility to climate-related shocks and disasters. As we navigate through these complexities, it becomes increasingly evident that aligning strategies with global Sustainable Development Goals (SDGs) across various geographical scales is paramount. This alignment incorporates perspectives of environmental sustainability, climate adaptation, and disaster

resilience. In light of these considerations, this course aims to equip students with the knowledge and skills necessary to address and mitigate the impacts of disasters in a holistic manner.

Course Objective(s):

● to provide understanding of the concepts related to disaster

● to highlight the importance and role of disaster management

● to enhance awareness of institutional processes and management strategies to mitigate

the impacts of disasters

Course Content:

Unit 1: Concepts and Terminologies

Understanding key concepts of Hazards, disasters; Disaster types and causes (Geophysical, Hydrological, Meteorological, Biological and Atmospheric; Human-made); Global trends in disasters - Impacts (Physical, Social, Economic, Political, Environmental and Psychosocial); Defining Vulnerability (Physical Vulnerability; Economic Vulnerability; Social Vulnerability)

Unit 2: Key concepts of Disaster Management Cycle

Components of disaster management cycle (Phases: Response and recovery, Risk assessment, Mitigation and prevention, Preparedness planning, Prediction and warning); Disaster risk reduction (DRR), Community based disaster risk reduction

Unit 3: Initiatives at national and international level

Disaster Risk Management in India and at international level: Related policies, plans, programmes and legislation; International strategy for disaster reduction and other initiatives

Unit 4: Emergency Management

Explosion and accidents (Industrial, Nuclear, Transport and Mining) - Spill (Oil and Hazardous

material); Threats (Bomb and terrorist attacks) - Stampede and conflicts Training and Demonstration Workshops (at least two workshops) be organized in association with the NIDM, NDRF, NCDC, Param Military, Fire Brigade, CISF, local administration etc.

Readings

1. Sharma, S.C. (2022), Disaster Management, Khanna Book Publishing.

2. Clements, B. W., (2009): Disasters and Public Health: Planning and Response, Elsevier Inc.

3. Dunkan, K., and Brebbia, C. A., (Eds.) (2009): Disaster Management and Human Health Risk: Reducing Risk, Improving Outcomes, WIT Press, UK.

4. Singh, R. B. (ed.), (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.

5. Ramkumar, Mu, (2009) Geological Hazards: Causes, Consequences and Methods of Containment, New India Publishing Agency, New Delhi.

6. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.

7. Carter, N. (1991) Disaster Management: A Disaster Management Handbook. Asian Development Bank, Manila.

8. Govt. of India (2008) Vulnerability Atlas of India. BMTPC, New Delhi.

9. Govt. of India (2011) Disaster Management in India. Ministry of Home Affairs, New Delhi.

10. Matthews , J.A., (2002) Natural Hazards and Environmental Change, Bill McGuire, Ian Mason.

E-Resources

http://www.ndma.gov.in/en/

http://nidm.gov.in/

https://www.unisdr.org/

http://www.emdat.be

https://www.weather.gov/safety/

https://www.preventionweb.net/risk/vulnerability

Course Outcomes:

Upon successful completion of this course, students will be able to:

i. Articulate the critical role of disaster management in reducing risks and enhancing resilience

ii. Identify and describe key institutional frameworks and processes in disaster management.

iii. Conduct risk assessments and develop disaster management plans for specific scenarios

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SEMESTER –IV

SEMESTER –IV

Entrepreneurship and Startup Ecosystem

SBCACT1251	Entrepreneurship and Startup Ecosystem	1L:1T:0P	2 Credits

Course Objective(s):

- To understand Entrepreneurship and its types

- To understand that not all ideas can be turned into viable business models and guestimate

business potential of an idea

- To understand different type of finances available and financing methods

- To be able to draft business plans on an identified idea

- To understand the nuances of operating a startup – low budget marketing, stabilizing operations, build a team from scratch and scaling the business

- To know what is a Family Business and how is it different from Entrepreneurship

Course Content:

Unit 1: Introduction to Entrepreneurship & Family Business

- Definition and Concept of entrepreneurship

- Entrepreneur Characteristics

- Classification of Entrepreneurs

- Role of Entrepreneurship in Economic Development –Start-ups

- Knowing the characteristics of Family business with discussion on few Indian cases of Family Business like Murugappa, Dabur, Wadia, Godrej, Kirloskar etc.

Unit 2: Evaluating Business opportunity

- Sources of business ideas and opportunity recognition

- Guesstimating the market potential of a business idea

- Feasibility analysis of the idea

- Industry, competition and environment analysis-SWOT, PESTLE & PORTER'S 5 Forces Model

Unit 3: Building Blocks of starting ventures

- Low cost Marketing using digital technologies

- Team building from scratch

- Establishing the value-chain and managing operations

- Legal aspects like IPR and compliances

Unit 4: Start-up Ecosystem

- Know the components of the start-up ecosystem including Incubators, Accelerators, Venture Capital Funds, Angel Investors, Bank

- Know various govt. schemes like Start-up India, Digital India, MSME etc.

- Sources of Funding-Venture, Angel Invest

- Source of Technology, Intellectual Property Rights (IPR)

Text Books (Latest Edition):

1. Startup India Leaning Program by Start Up India available at www.startupindia.gov.in

 2. Entrepreneurship, Rajeev Roy, Oxford University Press

 3. Entrepreneurship: Successfully Launching New Ventures by R. Duane Ireland Bruce R. Barringer, Pearson Publishing

4. Family Business Management by Rajiv Agarwal, Sage Publishing

5. Anish Tiwari (2003), "Mapping the Startup Ecosystem in India", Economic & Political Weekly

6. Ramachandran, K, Indian Family Businesses: Their survival beyond three generations, ISB Working Paper Series

7. Entrepreneurship Development & Management by Dr. Vasant Desai, Dr. Kulveen Kaur, Himalaya Publishing House

Course Outcome(s):

At the end of the course, the student would be able to -

● Understand basic building blocks of creating a venture

● Be able to identify a business opportunity and translate it into a viable business model

● Identify the elements of the Indian entrepreneurship ecosystem and take relevant

benefits from the constituents

● Know the legacy of family businesses and key differentiations from entrepreneurship

Computer Networks

SBCACT1252	Computer Networks	3L:0T:0P	3 Credits

Course Objectives:

CO1: Understand the fundamental concepts of Computer Networks and their applications.

CO2: Develop problem-solving skills related to network design, implementation, and

troubleshooting.

CO3: Implement network protocols and configure network devices.

Prerequisites:

1. Basic Networking Knowledge: Familiarity with basic networking concepts such as IP addressing and network topologies.

2. Programming Skills: Ability to write basic network programs and scripts in languages such as Python or C.

3. Operating Systems: Understanding of OS concepts related to networking, such as process management and memory allocation

Course Content:

UNIT I: Introduction to Computer Networks

Overview of Computer Networks: Definition and Objectives, Applications and Examples Network Components and Architecture

Network Models: OSI Model: Layers and Functions, TCP/IP Model: Layers and Functions Comparison between OSI and TCP/IP Models

Network Topologies: Physical vs. Logical Topologies, Common Topologies: Star, Ring, Bus, Mesh, Hybrid, Advantages and Disadvantages of Each Topology

Data Transmission: Analog vs. Digital Signals, Transmission Modes: Simplex, Half-Duplex, Full-Duplex, Bandwidth and Latency

Networking Devices: Routers, Switches, Hubs, Bridges, Gateways, Functions and Configurations of Each Device.

UNIT II: Data Link Layer and Networking Protocols

Data Link Layer Fundamentals: Functions of the Data Link Layer, Framing, Error Detection, and Error Correction, Flow Control Mechanisms.

Ethernet: Ethernet Standards and Frame Structure, MAC Addressing

Network Protocols: Introduction to TCP/IP Protocol Suite, **IP Addressing:** IPv4 and IPv6

UNIT III: Network Layer and Transport Layer

Network Layer: IP Routing: Static vs. Dynamic Routing, **Routing Protocols:** RIP, OSPF, BGP

Transport Layer: TCP vs. UDP: Characteristics and Use Cases, TCP Handshake and Connection Management, Flow Control and Congestion Control in TCP

Network Security Fundamentals: Threats and Vulnerabilities, Basic Security Mechanisms: Firewalls, VPNs, Encryption

UNIT IV: Application Layer and Emerging Technologies

Application Layer Protocols: HTTP/HTTPS: Structure and Operation, FTP, SMTP, POP3, IMAP: Protocols and Uses, DNS: Domain Name System and Resolution

Network Applications: Web Browsing, Email Communication, File Transfer, Voice over IP (VoIP) and Streaming.

Text Books:

1. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education, 2011.

2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", 8th Edition, Pearson, 2021.

Reference Books:

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw-Hill Education, 2012.

2. Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", 6th Edition, Morgan Kaufmann, 2019.

3. Bhavneet Sidhu, An Integrated Approach to Computer Networks, Khanna Publishing House, 2023.

4. Mastering PC Hardware & Networking, Khanna Publishing House, 2024.

Web Resources:

1. Cisco Networking Academy - Online Courses and Resources

2. NetworkLessons.com - Tutorials on Various Networking Topics

SBCACP1251	LAB-2: Computer Networks	0L:0T:4P	2 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon   coverage of syllabus points. However, the modified list must match with CO-PO mapping .

Suggested list of Experiments (not limited to):

1. Configure Basic Network Settings:

a) IP Address Configuration

b) Subnet Mask and Gateway Settings

2. Implement Network Protocols:

a) Write a simple Python script to perform DNS resolution.

b) Implement a basic HTTP client-server application.

3. Network Simulation:

a) Use network simulation tools (e.g., Cisco Packet Tracer) to design and simulate network topologies.

b) Configure routers and switches in a simulated environment.

4. Performance Measurement:

a) Measure network performance using tools like `ping`, `traceroute`, and `iperf`.

b) Analyze network traffic using Wireshark.

5. Implement VLANs:

   a) Configure VLANs on a switch and verify using simulation tools.

6. Set Up a Simple Web Server:

   a) Deploy a basic web server and configure HTTP/HTTPS access.

7. Network Security Lab:

a) Implement basic firewall rules and VPN configurations.

b) Perform vulnerability scanning and analyze results.

8. Network Troubleshooting:

a) Diagnose and resolve common network issues.

b) Use troubleshooting commands and techniques to fix connectivity problems.

Design and Analysis of Algorithms

SBCACT1253	Design and Analysis of Algorithms	3L:0T:0P	3 Credits

Course Objectives:

CO1: This course envisions to impart to students the understanding of basic algorithm designing paradigms.

CO2: This course introduces the basic knowledge on how to analyse an algorithm.

CO3: This course expects to enable a student to synthesize efficient algorithms in   common design situations and real-life problems.

Prerequisite: Knowledge of Data Structures

Course Content:
UNIT I:

What is an algorithm? Design and performance analysis of algorithms, time complexity, space complexity.

Asymptotic notations (O, Ω, ϴ) to measure growth of a function and application to measure complexity of algorithms.

Analysis of sequential search, bubble sort, selection sort, insertion sort, matrix multiplication.

Recursion: Basic concept. Analysis of recursive algorithms, Master's theorem.

UNIT II:

The Divide & Conquer Design Technique:

The general concept. Binary search, finding the maximum and minimum, merge sort, quick sort. Best and worst-case analysis for the mentioned algorithms. Strassen's matrix multiplication.

Lower bound for comparison-based sorting.

The Greedy Design Technique:

The general concept. Applications to general Knapsack problem, finding minimum weight

spanning trees: Prim's and Kruskal's algorithms, Dijkstra's algorithm for finding single source shortest paths problem.

UNIT III:

The Dynamic Programming Design Technique:

The general concept. Computation of Fibonacci series and Binomial coefficients, all pair shortest paths problem (Floyd-Warshall's algorithm), 0/1 Knapsack problem.

Algorithms on Graphs:

Breadth First Search, Depth First Search, finding connected components, depth first search of a directed graph, topological sorting.

UNIT IV:

Limitations of Algorithmic Power:

Backtracking Method: n-Queen problem; sum of subsets problem/ Hamiltonian circuit problem/vertex cover problem.

Computational Intractability: Overview of non-deterministic algorithms, P, NP, NP-Complete and NP-hard problems.

Text Books

1. Gajendra Sharma, Design and Analysis of Algorithms, Khanna Publishing House (AICTE Recommended Textbook)

2. Cormen Thomas H., Leiserson Charles E., Rivest Ronald L. and Stein Clifford, Introduction to Algorithms, PHI publication, 3 rd Edition, 2009.

3. Horowitz Ellis, Sahni Sartaj and Rajasekaran Sanguthevar, Fundamentals of Computer Algorithms, University Press (I) Pvt. Ltd., 2012.

4. Levitin Anany, Introduction to Design and Analysis of Algorithms, 3 rd Edition, Pearson, 2012

Reference Books

1. Aho Alfred V., Hopcroft John E. & Ullman Jeffrey D., The Design & Analysis of Computer Algorithms, Addison Wesley Publications, Boston, 1983.

2. Kleinberg Jon & Tardos Eva, Algorithm Design, Pearson Education, 2006.

Web Resources

1. https://nptel.ac.in/courses/106101060

2. https://www.cs.umd.edu/~mount/451/Lects/451lects.pdf

Artificial Intelligence

SBCACT1254	Artificial Intelligence	3L:0T:0P	3 Credits

Prerequisites:

Basic understanding of computer science concepts, including data structures and algorithms.

Proficiency in minimum one programming language, such as Python.

Course Content:

 UNIT I: Introduction to AI

What is AI? Intelligent Agents: Agents and environment, the concept of Rationality, the nature of environment, the structure of Agents. Knowledge-Based Agents: Introduction to Knowledge-Based Agents, The Wumpus World as an Example World. Problem-solving: Problem-solving agents.

UNIT II: Advanced Search Techniques

Uninformed Search: DFS, BFS, Iterative Deepening Search. Informed Search: Best First Search, A* search, AO* search. Adversarial Search & Games: Two-player zero-sum games, Minimax Search, Alpha-Beta pruning. Constraints and Constraint Satisfaction Problems (CSPs), Backtracking search for CSP.

UNIT III: Logical Reasoning and Uncertainty

Logic: Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting. Inference: Forward chaining, Backward chaining, Resolution, Truth maintenance systems. Introduction to Planning: Blocks World problem, Strips; Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning,
Introduction to Fuzzy set theory.

UNIT IV: Domains and Applications of AI

Domains in AI: Introduction to Machine Learning, Computer Vision, Robotics, Natural Language Processing, Deep Neural Networks, and their applications. Expert Systems: The architecture and role of expert systems include two case studies. Legal and Ethical Issues: Concerns related to AI.

Text Books:

1. M.C. Trivedi, A Classical Approach to Artificial Intelligence, Khanna Book Publishing Company, 2024 (AICTE Recommended Textbook).
2. Nilsson Nils J, Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4.
3. Dan W Patterson, Introduction to Artificial Intelligence & Expert Systems, PHI Learning 2010.
4. Rajiv Chopra, Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Khanna Book Publishing Company, 2024.

Reference Books:

1. M.C. Trivedi, Introduction to AI and Machine Learning, Khanna Book Publishing Company, 2024.

2. Russell, S. and Norvig, P., "Artificial Intelligence - A Modern Approach", 3rd edition, Prentice Hall

3. Van Hirtum, A. & Kolski, C. (2020). Constraint Satisfaction Problems: Algorithms and Applications. Springer

4. Rajiv Chopra, Machine Learning and Machine Intelligence, Khanna Book Publishing Company, 2024.

Course Outcomes:

CO1: Understand the characteristics of rational agents, and the environment in which they operate, and gain insights about problem-solving agents.

CO2: Gain insights about Uninformed and Heuristic search techniques and apply them to solve search applications.

CO3: Appreciate the concepts of knowledge representation using Propositional logic and Predicate calculus and apply them for inference/reasoning.

CO4: Obtain insights about Planning and handling uncertainty through probabilistic reasoning and fuzzy sets.

CO5: Obtain a basic understanding of the AI domains and their applications and examine the legal and ethical issues of AI

Artificial Intelligence

SBCACP1252	Lab-3 Artificial Intelligence	0L:0T:4P	2 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However, the modified list must match with CO-PO mapping.

Prerequisites: Basic understanding of algorithms and data structures (e.g., trees, graphs, lists). Proficiency in Python programming, including libraries like NLTK for NLP tasks.

The lab experiments may be implemented in Python. Libraries like NLTK, Tensorflow and Keras may be used for Machine learning experiments.

Suggested list of Experiments (not limited to):

1. Demonstrate basic problem-solving using Breadth-First Search on a simple grid.

2. Implement Depth-First Search (DFS) on a small graph.

3. Solve the Water Jug Problem using Breadth First Search (BFS).

4. Implement a Hill Climbing search to find the peak in a numeric dataset.

5. Apply the A* Search algorithm to find the shortest path in a 4x4 grid.

6. Implement the Minimax search algorithm for 2-player games. You may use a game tree with 3 plies.

7. Solve the 4 – Queens Problem as a CSP backtracking problem.

8. Use constraint propagation to solve a Magic Square puzzle.

9. Apply optimization techniques to find the maximum value in a list.

10. Represent and evaluate propositional logic expressions.

11. Implement a basic rule-based expert system for weather classification.

12. Implement a basic AI agent with simple decision-making rules.

13. Implement a basic Rule-Based Chatbot.

14. Using Python NLTK, perform the following Natural Language Processing (NLP) tasks for text content.

a) Tokenizing

b) Filtering Stop Words

c) Stemming

d) Part of Speech tagging

e) Chunking

f) Named Entity Recognition (NER)

15. Perform Image classification for a given dataset using CNN. You may use Tensorflow / Keras.

Course outcomes:

CO1: Apply Uninformed Search Algorithms and Implement Heuristic Search techniques

CO2: Analyze and Solve Constraint Satisfaction Problems

CO3: Develop Rule-Based Systems

CO4: Implement and Evaluate Optimization Techniques

CO5: Apply and illustrate the NLP concepts

Professional Elective -II

	Professional Elective -II (Data Science / Artificial Intelligence and Machine Learning)	1L:0T:4P	3 Credits

Data Science

SBCAET1251	Data Visualization	1L:0T:0P	1 Credit

Course Objectives

CO1: Understand the fundamentals of data visualization and its importance.

CO2: Learn about visual perception and its impact on data interpretation.

CO3: Explore the ethical considerations and challenges in data visualization.

CO4: Study different types of visualizations and their appropriate uses.

CO5: Utilize Power BI to create and customize various types of visualizations.

Prerequisite:

Familiarity with using a computer, including file management and basic software navigation. Basic knowledge of data structures, such as tables and databases. Basic understanding of data analysis concepts and familiarity with data types.

Course Content:

UNIT I: Introduction to Data Visualization

Definition and importance of data visualization-Role of data visualization in decision making- Types of data (numerical, categorical, temporal, geographical)-Data visualization process (data collection, exploration, analysis, visualization, interpretation)-Challenges and limitations of data visualization

UNIT II: Visualization tools & Data Storytelling

Overview of Visualization Tools (e.g., Excel, Tableau, Power BI, Python)- Comparing and contrasting features and Use Cases among these tools. Principles of Data Storytelling: Narrative and Context-Best Practices for Dashboard Layout and Interactivity

UNIT III: Designing Effective Visualizations

Principles of Good Visualization Design - Understanding and Using Color in Visualizations – Importance of Data Modelling in Visualization.

Text Books

1. "Storytelling with Data: A Data Visualization Guide for Business Professionals" Cole Nussbaumer Knaflic, Wiley; 1st edition, 2015.

2. "The Visual Display of Quantitative Information" by Edward Tufte, Graphics Press USA; 2nd edition, 2001.

Reference Books

1. "Data Visualization: A Practical Introduction" Kieran Healy, Princeton University Press, 2018.

2. "Analyzing Data with Power BI and Power Pivot for Excel", Alberto Ferrari and Marco Russo, Microsoft Press; 1st edition, 2017.

3. "Microsoft Power BI Complete Reference", Devin Knight, Brian Knight, Mitchell Pearson, and Manuel Quintana, Packt Publishing; 1st edition, 2018.

Web Resources

1. https://learn.microsoft.com/en-us/power-bi/

2. https://www.storytellingwithdata.com/

3.https://jpsm.umd.edu/sites/jpsm.umd.edu/files/syllabi/Syllabus_Introduction%20to%20 Data%20Visualization_Spring%202024.pdf

Lab-2 Programs for Data Visualization Using Power BI

SBCAEP1251	Lab-2 Programs for Data Visualization Using Power BI	1L:0T:0P	1 Credits

Note: Practicals are suggestive and as per CO-PO Mappings. Concerned teacher has freedom to modify, select all or a subset of these depending upon coverage of syllabus points. However, the modified list must match with CO-PO mapping.

Suggested list of Experiments (not limited to):

Introduction to Power BI Interface and Basics

1. Installation and interface overview

2. Exploring the Power BI workspace: Ribbon, panes, and canvas.

3. Importing data from Excel and CSV files.

4. Introduction to multiple data sources

5. Basic report creation: Adding visuals and saving a report.

Data Transformation and Preparation

1. Using Power Query Editor

2. Cleaning data: Removing duplicates, handling missing values.

3. Transforming data: Splitting columns, changing data types, renaming columns.

4. Merging and appending queries.

5. Creating custom columns and calculated columns

Data Modeling

1. Creating relationships between tables

2. Identifying and resolving data inconsistencies

3. Creating calculated columns and measures

Creating Basic Visualizations

1. Creating various chart types (bar, column, line, pie, area, etc.,)

2. Formatting and customizing visualizations

Publishing and Sharing Reports

1. Publishing a report to Power BI Service.

2. Sharing reports and dashboards with team members.

3. Setting up data refresh schedules and managing permissions.

Introduction to Machine Learning

SBCAET1251	Introduction to Machine Learning	1L:0T:0P	1 Credits

Prerequisites: Basic knowledge of statistics and probability. Familiarity with fundamental programming concepts and proficiency in Python.

Course Content:

UNIT I: Introduction to Machine Learning

Introduction: Definition, History and Application of Machine Learning,

Types of Machine Learning: Supervised, Unsupervised, Semi-Supervised, and Reinforcement Learning. Labelled and Unlabelled Dataset.

Supervised Learning Tasks: Regression vs. Classification,

Learning Framework: Training, Validation and Testing of ML models.

Performance Evaluation Parameters: Confusion matrix, Accuracy, Precision, Recall, F1 Score, and AUC.

UNIT II: Supervised Learning and Unsupervised Learning

Regression: Linear and non-linear Regression, Logistic Regression.

Classification: Naïve Bayes, K-Nearest Neighbors, Decision Trees.

Linear model: Introduction to Artificial Neural Networks, Perceptron Learning Algorithm, Single Layer Perceptron, Introduction to Support Vector Machine for linearly separable data. Clustering: K-Means, Hierarchical Clustering, DBSCAN, Clustering Validation Measures.

ML Applications: Ethical Considerations in Machine Learning, Case study and Real-world Applications.

Text Books:

1. Rajiv Chopra (2024), Machine Learning and Machine Intelligence, Khanna Publishing House.

2. Jeeva Jose (2023), Introduction to Machine Learning, Khanna Publishing House.

3. Mitchell T. (1997). Machine Learning, First Edition, McGraw-Hill.

4. Kalita, J. K., Bhattacharyya, D. K., & Roy, S. (2023). Fundamentals of Data Science: Theory and Practice. Elsevier. ISBN9780323917780

Reference Books:

1. Flach, P. A. (2012). Machine Learning: The Art and Science of Algorithms that Make Sense of Data. Cambridge University Press. ISBN: 9781107422223, 2012.

2. Duda, R. O., Hart, P. E., Stork, D (2007). Pattern classification (2Ed), John Wiley & Sons, ISBN-13: 978-8126511167.

3. Haykin S. (2009). Neural Networks and Learning Machines, Third Edition, PHI Learning.

4. Chollet, F. (2018). Deep Learning with Python. Manning Publications.

5. Bishop, C. M. (2006). Pattern Recognition and Machine Learning. Springer.

6. Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.

7. Géron, A. (2017). Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems* (1st ed.). O'Reilly Media.

Course Outcomes

CO1: Define and explain machine learning concepts, types, and basic metrics.

CO2: Implement and apply supervised learning techniques (e.g., KNN, Linear Regression, Logistic Regression).

CO3: Apply unsupervised learning methods (e.g., K-Means, Hierarchical Clustering, Association Rules).

CO4: Develop and evaluate simple machine learning models (e.g., Perceptron, single-layer neural networks).

CO5: Analyze and apply appropriate machine learning algorithms depending on the problems with some real-world data.

Lab-2 Introduction to Machine Learning

SBCAEP1251	Lab-2 Introduction to Machine Learning	1L:0T:4P	2 Credits

Prerequisites: Understanding of machine learning algorithms and concepts (e.g., classification, clustering, regression). Proficiency in Python programming, with experience using libraries such as NumPy, pandas, Scikit-Learn, NLTK, Matplotlib, and Seaborn.

The lab experiments may be implemented in Python using relevant ML libraries, and datasets from Kaggle, public repositories, or generated datasets.

Suggested list of Experiments (not limited to):

1. Implement linear regression on a dataset and visualize the regression line.
2. Implement logistic regression on a binary classification dataset and plot the decision boundary.
3. Implement and evaluate the performance of Decision tree ID3/Cart classifier for any given dataset.
4. Implement and evaluate the performance of the Naive Bayes Classifier on a given dataset.
5. Build and evaluate a random forest classifier using a numerical dataset.
6. Implement a support vector machine for linearly separable classes and visualize the margins and decision boundary.
7. Implement K-Means clustering on a point dataset and visualize and evaluate the clusters.
8. Implement hierarchical clustering on a dataset and plot the dendrogram.
9. Implement DBSCAN clustering on a dataset and visualize and evaluate the clusters.
10. Perform Principal Components Analysis (PCA) and apply any one or more classifiers
to show the performance variation with or without feature reduction.
11. Build a single layer perceptron model to classify AND, OR, and XOR problems (may use TensorFlow/Keras) and visualize their decision boundaries. Also evaluate its performance.
12. Demonstrate the concept of boosting using the AdaBoost algorithm.

Course Outcomes:

CO1: Implement and evaluate supervised learning techniques, including K-Nearest Neighbors, linear regression, and logistic regression, and measure model performance using accuracy, precision, recall, and F1 score.

CO2: Apply and visualize clustering algorithms such as K-Means, hierarchical clustering, and DBSCAN on datasets. This practical application helps you understand their real-world use.

CO3: Perform dimensionality reduction using Principal Component Analysis (PCA) and interpret the results.

CO4: Develop and assess classification models using random forests, support vector machines, and neural networks.

CO5: Demonstrate ensemble learning concepts through bagging with random forests and boosting with the AdaBoost algorithm.

Design Thinking and Innovation

SBCAST1251	Design Thinking and Innovation	1L:1T:0P	2 Credits

Course Objectives:

Operating under turbulent and uncertain business environment, 'innovation' has become the key driver of organizational success for all companies. Managers are expected to be leading this change by navigating companies into rapid evolution of new products/services and business models.

The primary focus of DTI is to help learners develop creative thinking skills and apply design-based approaches/tools for identifying and implementing innovation opportunities into implementable projects.

Following a learning-by-doing approach, the objectives of the course are

1. Introduce students to design-based thinking approach to solve problems

2. Observe and assimilate unstructured information to well framed solvable problems

3. Introduce student to templates of ideation

4. Understand the importance of prototyping in the innovation journey

5. Implementing innovation projects

Course Content:

Unit 1: Basics of Design Thinking

1. Understand the concept of innovation and its significance in business

2. Understanding creative thinking process and problem-solving approaches

3. Know Design Thinking approach and its objective

4. Design Thinking and customer centricity – real world examples of customer challenges, use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product.

5. Discussion of a few global success stories like AirBnB, Apple, IDEO, Netflix etc.

6. Explain the four stages of Design Thinking Process – Empathize, Define, Ideate, Prototype, Implement

Unit 2: Learning to Empathize and Define the Problem

1. Know the importance of empathy in innovation process – how can students develop empathy using design tools.

2. Observing and assimilating information

3. Individual differences & Uniqueness Group Discussion and Activities to encourage the understanding, acceptance and appreciation of individual differences.

4. What are wicked problems

5. Identifying wicked problems around us and the potential impact of their solutions

Unit 3 : Ideate, Prototype and Implement

1. Know the various templates of ideation like brainstorming, systems thinking

2. Concept of brainstorming – how to reach consensus on wicked problems

3. Mapping customer experience for ideation

4. Know the methods of prototyping, purpose of rapid prototyping.

5. Implementation

Unit 4 : Feedback, Re-Design & Re-Create

1. Feedback loop, focus on User Experience, address ergonomic challenges, user focused design

2. Final concept testing,

3. Final Presentation – Solving Problems through innovative design concepts & creative solution

Text Books (Latest Edition):

1. E Balaguruswamy (2023), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company

2. Tim Brown, (2008), "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", Harvard Business Review

3. 8 steps to Innovation by R T Krishnan & V Dabholkar, Collins Publishing

Reference Book

1. Design Thinking by Nigel Cross, Bloomsbury

Course Outcome(s):

By the end of the course, students will be able to –

● Propose real-time innovative product designs and choose appropriate frameworks, strategies, techniques during prototype development.

● Know wicked problems and how to frame them in a consensus manner that is agreeable to all stakeholders using appropriate frameworks, strategies, techniques during prototype

development.

● Analyse emotional experience and Inspect emotional expressions to better understand users while designing innovative products

॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

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राष्ट्रीय शैक्षणीक धोरण–२०२० नुसार पदवी प्रथम वर्षातील **VEC** अंतर्गत **Constitution of India** या विषयाचा सर्व विद्याशाखेसाठी **Common Syllabus** शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक १६ जून २०२३ रोजी संपन्न झालेल्या मा. विद्यापरिषदेच्या बैठकीतील ऐनवेळचा विषय क्रमांक ०४/०६/०८/१०/५६–२०२३ अन्वये मान्यता दिल्यानुसार ✔ विज्ञान व तंत्रज्ञान विद्याशाखा, मानवविज्ञान विद्याशाखा, आंतर विद्याशाखीय अभ्यास विद्याशाखा व वाणिज्य व्यवस्थापन विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरणानुसार–२०२० नुसार पदवी अभ्यासक्रम आराखड्यातील पदवी प्रथम वर्षाच्या VEC अंतर्गत Constitution of India या विषयाचा Common Syllabus शैक्षणिक वर्ष २०२४–२५ पासुन लागू करण्यात येत आहे.

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनईपी/पदवी/२०२४–२५/**१३६**
दिनांक ०३.०७.२०२४

डॉ. सरिता लोसरवार
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : १) मा. आधिष्ठाता, सर्व विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) मा. संचालक, सर्व संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
५) मा. प्राचार्य, न्यू मॉडेल डिग्री कॉलेज हिंगोली.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED-431606

(Structure and Syllabus of Four Years Multidisciplinary Degree Program with Multiple Entry and Exit Option)

Syllabus
BACHELOR OF ALL
Value Education Course on
Constitution of India

Under the Faculty of ALL

Effective from Academic Year 2024-2025
(As per NEP -2020)

Forward by the Dean, Faculty of Humanities

From the Desk of the Dean:

NEP 2020 proposes a new and forward-looking vision for India's Higher Education System through quality universities and colleges. Its key is in the curriculum and its practical implementation.

The curriculum must be exciting, relevant, and regularly updated to align with the latest knowledge requirements and meet specified learning outcomes. High-quality pedagogy is necessary to impart the curricular material to students successfully; pedagogical practices determine the learning experiences provided to students, thus directly influencing learning outcomes. The assessment methods must be scientific, designed to improve learning continuously test the knowledge application.

The university's proper framing and development of syllabi will result in the upbringing and nourishment of multidisciplinary and holistic citizens. Emphasis is on outcome-based learning. Every course has well-defined objectives and outcomes. The assessment guidelines also provide clarity and precision to the vision behind prescribing the particular course content.

NEP foresees more vibrant, socially engaged, cooperative communities and a happier, cohesive, cultured, productive, innovative, progressive, and prosperous nation. The introduction of Research Methodology and ethics will widen the vision and broaden the perspectives of the learners.

Introducing Case Studies and Field Projects has created a unique opportunity for the higher education institute to bridge the gap between the academia, industry and the community NEP believes effective learning requires a comprehensive approach that involves an appropriate curriculum, engaging pedagogy, continuous formative assessment, and adequate student support.

We are sure that the Postgraduate centres of this university and its affiliated colleges will implement the course effectively and successfully, resulting in a healthy and more creative academic ambience.

Dean, Faculty of Humanities,
Swami Ramanand Teerth Marathwada University, Nanded.

From Desk of Chairman, Board of Studies of the Subject Political Science

Preamble:

The present course is available to the first year degree students of all streams. The main intention of this course is to study the _Indian Constitution_ as a Value Education course and it brings perspective to the current religious, economic, social and political climate in the country. It helps the Students to get basic knowledge about Indian Constitution. This also makes the students aware about the basic use of their duties as well as rights. The course offers a quick awareness on Indian constitution and would serve as a primary step for studying constitutional law. Learner can enroll to this course for having brief insight about Indian Constitution.

The course on constitution of India highlights key features of Indian Constitution, like directive principles of state policy, fundamental rights and duties, and the various organs of constitution. The course aims at providing general awareness about the Indian Constitution, and is not developed for the study on Law. Some of the topics are read like a podcast so as to provide learners about the feel of audio book. The purpose of inputting audio texts is the difficult, which learners might come across in reading and understanding heavy worded legal texts. Course offers easy and quick understanding about constitution of India. Also, it can be recommended to students studying law, as a preliminary overview.

A Constitution helps to serve as a set of principles, rules and procedures on which there is a consensus. This includes not only an agreement on the type of government but also on certain ideals that the country should uphold. The Indian Constitution has certain core constitutional values that constitute its spirit and are expressed in various articles and provisions. In fact, value is that which is very essential or 'worth having and observing 'for the existence of human society as an entity. The Indian Constitution Contains all such values, that are the universal, human and democratic of the modern age.

The Constitution of India serves several purposes. It lays down certain ideals that form the basis of the country that we as citizens aspire to live in. A country is usually made up of different communities of people who share certain beliefs, but may not necessarily agree on all issues. The constitutional values are reflected in the entire Constitution of India, Its Preamble embodies 'the fundamental values and the philosophy on which the Constitution is based. These are: sovereignty, socialism, secularism, democracy, republican character, justice, liberty, equality, fraternity, human dignity and the unity and integrity of the   Nation. Moreover, teaching about constitution does not merely mean giving information and knowledge in the classroom, but it also covers all modalities which could sensitize a person, awaken his/her conscience and develop an attitude of behaving decently in a social set up

I, as Chairman, Board of Studies in Political Science Swami Ramanand Teert Marathwada University Nanded , happy to state here that, Program Educational Objectives were finalized in a meeting where more than 11 members from different Institutes were attended, who were either Heads or their representatives of Political Science Department. The Program Educational Objectives finalized for undergraduate in all streams are listed below;

Program Objectives of Constitution of India:

➢ To develop the understanding of constitutional fundamental rights and duties, sovereignty and socialism.

➢ To aware the students about values of justice, equality, liberty, brotherhood and endeavor to promote fraternity among them.

➢ To realize the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.

➢ To understand the functioning of Union, State and Local Governments in Indian federal system.

➢ To understand the framework defining fundamental political principles, establishing the structure, procedures, powers and duties of government institutions and sets out fundamental rights, directive principles and the duties of citizens.

Program Learning Outcomes of Constitution of India:

At the end of the successful completion of the course, the students will be able to

➢ Understand the key aspects and concept of the Indian Constitution.
➢ Comprehend the structure and philosophy of the Constitution.
➢ Realize the significance of the constitution and appreciate the role of constitution and citizen oriented measures in a democracy.
➢ Understand the Fundamental Rights and Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their Social Responsibilities.
➢ Apply the knowledge on directive principle of state policy.
➢ Analyze the History, features, and principles of Indian constitution.

In addition to above more program educational objectives of their own may be added by affiliated Institute. In addition to Program Educational Objectives, for each course of undergraduate program, objectives and expected outcomes from learner's point of view are also included in the curriculum to support the philosophy of outcome based education. I believe strongly that small step taken in right direction will definitely help in providing quality education to the stake holders.

Dr.Ratnakar Baburao Lakshete

Chairman, Board of Studies of the <u>Political Science</u>

Swami Ramanand Teerth Marathwada University, Nanded

Swami Ramanand Teerth Marathwada University, Nanded

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14	Ku.Sapna Panchal	Student Representative	Maharashtra Mahavidyalaya , Nilanga	

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of ALL
Value Education Course (VEC) *(02 Credits)*

Semester	Details of Elective Course(s)	
	CODE	**Title of the Course**
Semester II	VECCOI1151	**Constitution of India**

Faculty of ALL in Value Education Course (VEC)
Under Graduate First Year Programme ,Semester II *(Level 4.5)*
Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs./ week 1 Hrs.=60 M.)	
			Theory	Practical	Total	Theory	Practical
Value Education Course (VEC)	VECCOI1151	**Constitution of India**	02		**02**	02	
Total Credits			**02**		**02**	**02**	

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of ALL in Value Education Course (VEC)
Under Graduate First Year Programme, Semester II *(Level 4.5)*
Examination Scheme

[20% Continuous Assessment (*CA)* and 80% End Semester Examination (*ESE*)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits of individual paper)

Subject	Course Code	Course Name	Theory					Total
			Continuous Assessment (CA)				ESE	Col. (6+7) /
			Test I (4)	Test II (5)	Assignment (6)	Avg of T1+T2+Assi. /3 (7)	Total (8)	(09)
Value Education Course	VECCOI1151	**Constitution of India**	10	10	10	10	40	50

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of ALL in Value Education Course (VEC)

Under Graduate First Year Programme, Semester II
Course Structure: - *Teaching Scheme*

(for 2 credits)						
Course Code	**Course Name** (Paper Title)	**Teaching Scheme (Hrs.)**		**Credits Assigned**		
		Theory	**CA**	**Theory**	**CA**	**Total**
VECCOI1151	**Constitution of India**	**30**	- - -	**02**	**--**	**02**

Assessment Scheme

Course Code	CourseName		Theory				Total
				CA		ESE (8)	[Col (7+8)
		Test I (4)	Test II (5)	Assignment (6)	Avg of T1+T2+Assi. /3 (7)		
VECCOI1151	**Constitution of India**	10	10	10	10	40	50

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of ALL in Value Education Course (VEC)

Under Graduate First Year Programme, Semester II
Paper Code : VECCOI1151
Title- Constitution of India *(VEC)*
Curriculum Details

Course Pre-requisite:

1. Any H.S.C. Passed Students from the Government Sanctioned Institutions
2. Any Students who is Eligible to entire at level 4.5

Course Objectives:

➢ This is a foundational course wherein the students will get acquainted with the meaning, evolution and working of the Constitution of India.
➢ The stakeholders come across several rights guaranteed to citizens of India, Duties, Directive Principles of State Policy and their importance in the leading a responsible citizenry.
➢ Understand the Judicial Structure and its Power.
➢ To know about Central Government functionalities in India.
➢ To make students understand the basic premises of Indian politics and role of constitution and citizen oriented measures in a democracy.
➢ This paper can also serve as a study material for the civil service examinations.

Course Outcomes:
At the end of the successful completion of the course, the students will be able to

- Know the sources, features and principles of Indian Constitution
- Understand historical background of the constitution making and its importance for building a democratic India
- Understand the value of the fundamental rights and duties for becoming good citizen of India
- Understand the structure of executive, legislature and judiciary
- Understand philosophy of fundamental rights and duties of Indian Citizens.
- Understand the making process of Indian Constitution.

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of ALL in Value Education Course (VEC)

Paper Code: VECCOI1151

Title- Constitution of India   (VEC)

Curriculum Details: (for 2 Credits)

Module No.	Unit No.	Topic	Hrs.Required to cover the contents 1 Hrs.=60 M.
1. 0		**Historical Background of Indian Constitution**	
	1.1	Formation and working of Constitutional Assembly and Drafting Committee	**08**
	1.2	Sources and Philosophical Base of Indian Constitution	
	1.3	Features of Indian Constitution	
2.0		**Indian Constitution**	
	2.1	Preamble	**08**
	2.2	Fundamental Rights and Duties	
	2.3	Directive Principles of State Policy	
3.0		**Indian Parliamentary Democracy**	
	3.1	Legislative - President , Lok-sabha, Rajya-sabha	**07**
	3.2	Executive - Prime Minister, Central Ministry of Council	
	3.3	Judiciary- Structure and Power, Judicial Review & Activism- PIL	
4.0		**Center-State Relations**	
	4.1	Legislative Relations	**07**
	4.2	Administrative Relations	
	4.3	Financial Relations	
		Total	**30**

Reference :
1. The Indian Constitution - Granville Austin
2. Ambedkar and Constitution, Raj Kumar, Commonwealth Publication Pvt. Ltd., New Delhi, 2011.
3. Sharma Brij Kishor ,Introduction to the Constitution of India ,Prentice Hall of India,New Delhi
4. Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
5. R.C.Agrawal, 1997, Indian Political System New Delhi, S.Chand and Company
6. M.V.Pylee, "Introduction to the Constitution of India",4th Edition, Vikas publication,2005
7. Merunandan, "Multiple Choice Questions on Constitution of India", 2 nd Edition, Meraga publication,2007.
8. J.N.Pandey, The Constitutional Law of India, Allahabad; Central Law Agency,(55th edn.) 2018.
9. Constitution of India (Full Text), India.gov.in., National Portal of India, https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf
10. K B Merunandan, Bharatada Samvidhana Ondu Parichaya, Bangalore, Meragu Publications, 2015.
11. K.Sharma, Introduction to the Constitution of India, Prentice Hall of India, New Delhi, 2002.
12. P.M Bakshi, Constitution of India, Universal Law Publishing House, New Delhi, 1999.
13. D.C.Gupta, Indian Government and Politics, Vikas publishing House, New Delhi,1975.
14. S.N.Jha, Indian Political System: Historical Developments, Ganga Kaveri Publishing House, Varanasi, 2005.
15. Arora & Mukherji, Federalism in India, Origin and Developments, Vikas Publishing House, New Delhi, 1992.
16. M.P. Jain , Indian Constitutional Law, M.P. Jain, LexisNexis
17. V.N.Shukla's Constitution of India, Mahndra Pal Singh, Eastern Book Company
18. Constitutional Law – I Structure, Udai Raj Rai, Eastern Book Company
19. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
20. Subash Kashyap, Indian Constitution, National Book Trust
21. J.A. Siwach, Dynamics of Indian Government & Politics
22. H.M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
23. J.C. Johari, Indian Government and Politics Hans
24. J. Raj Indian Government and Politics
25. Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
26. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

27. I. J. Ahluwalia and I.M.D. Little, India's Economic Reforms and Development, Delhi, Oxford University Press, 1998.
28. R. Baird (ed.), Religion in Modern India, New Delhi, Manohar, 1981.
29. P. Bardhan, The Political Economy of Development in India, Oxford, Blackwell, 1988.
30. U. Baxi, Political Justice, Legislative Reservation for Scheduled Castes, and Social Change, Madras, University of Madras, 1990.
31. S. Bayly, Caste, Society and Politics in India from the Eighteenth Century to the Modern Age, Cambridge, Cambridge University Press, 1999.
32. S. Bose and A. Jalal (eds.), Nationalism, Democracy and Development: State and Politics in India, Delhi, Oxford University Press, 1997.
33. N. Chandhoke, Beyond Secularism: The Rights of Religious Minorities, Delhi, Oxford University Press, 1999.
34. T. B. Hansen, The Saffron Wave: Democracy and Hindu Nationalism in Modern India, Princeton NJ, Princeton University Press, 1999.
35. N. Jayal, Democracy and the State: Welfare, Secularism and Development in Contemporary India, Delhi, Oxford University Press, 1999.
36. R. Jeffery and P. Jeffery, Population, Gender and Politics: Demographic Change in Rural North India. Cambridge, Cambridge University Press, 1997.
37. S. Khilnani, The Idea of India, London, Hamish Hamilton, 1997.
38. T. K. Oomen, Protest and Change: Studies in Social Movements, New Delhi, Sage, 1990.
39. G. Omvedt, Reinventing Revolution: New Social Movements and the Socialist Tradition in India, London, ME Sharpe, 1993.
40. M. Weiner, Party Building in a New Nation: The Indian National Congress, Chicago, University of Chicago Press, 1967.
41. Federalism in Comparative Perspective, New Delhi, Centre for Policy Research, Konark, 1995.
42. M. Chadda, Ethnicity, Security and Separatism in India, Delhi, Oxford University Press, 1997.
43. P. Chatterjee (ed.), States and Politics in India, Delhi, Oxford University Press, 1997.
44. T. V. Sathyamurthy, Social Change and Political Discourse in India: Structures of Power, Movements of Resistance, Vols. 4, Oxford, Oxford University Press, 1996.
45. A. Abdul, Poverty Alleviation in India: policies and programmes, New Delhi, Ashish, 1994.
46. J. Adams, "Breaking Away: India's economy vaults into the 1990s" in M. Bouton and 1993.
47. B. Jalan (ed.), The Indian Economy: Problems and Prospects, New Delhi, Viking, 1992.
48. R. Jenkins, Democratic Politics and Economic Reform in India, Cambridge, Cambridge University Press, 1999.
49. V. Joshi, "Fiscal Stabilization and economic reform in India" in I.J. Ahluwalia and M.D. Little (eds.), India's Economic Reforms and Development: Essays for Man Mohan Singh, Delhi, Oxford University Press, 1998.
50. R. Khator, Environment, Development and Politics in India, Lanham Md, University Press of America, 1991.
51. A. Vanaik, The Painful Transition: Bourgeois Democracy in India, London, Verso, 1990.
52. P. Verma, The Great Indian Middle Class, Delhi, Viking, 1998.
53. M. Weiner, The Indian Paradox, Essays in Indian Politics, New Delhi, Sage, 1989.
54. Kshirsagar, Meenal, Politics & Society, Success Publications, Pune,2020
55. Nikalje, Tushar, Indian Election System Changes & Challenges, Universal Publication House, Delhi, 2018

56. Palshikar Suhas, Indian Democracy, Oxford India Short Introduction, 2017
57. Vora Rajendra, Palshikar Suhas, Indian Democracy Meaning & Perspective, Sage Publication New Delhi, 2003
58. एम.सी.खंडेला, 2005, भारतीय राजनीती का बदलता परिदृश्य , जयपूर ,पोइंटर प्रकाशन
59. एम.सी.खंडेला, 2005, भारतीय राजनीती सिद्धांत एंव व्यवहार , जयपूर ,पोइंटर प्रकाशन

60. Bharatache sanvidhan, Samata Prakashan, Nagpur (Marathi)
61. Bharatache Sanvidhan, Bhalaba Vibhute, Manovikas Prakashan (Marathi)
62. Apala Desh Apali Rajyaghatana, Ravinand Hoval, Bandhuta Prakashan, Solapur (Marathi)
63. Bharatache Sanvidhan, Choudhari Law Publishers, Pune/Jalgaon (Marathi).
64. मोरे (लांडगे) पी.एस., भारतीय शासन आणि राजकारण,लातूर ,अरुणा प्रकाशन ,२०१४
65. भोळे भा.ल., (जून २००३), भारतीय गणराज्याचे शासन आणि राजकारण, पिंपळापुरे ॲन्ड कं. पब्लिशर्स,नागपूर.
66. पळशीकर सुहास, देश-प्रदेश, युनिक अकॅडमी, पुणे.
67. पवार प्रकाश, भारतीय शासन आणि नेतृत्वाची वाटचाल, डायमंड पब्लिकेशन, पुणे. पाटील विलास, भारतीय संविधान, के.सागर पब्लिकेशन, पुणे.
68. पाटील बी.बी. व उर्मिला चव्हाण, भारतीय शासन आणि राजकारण, फडके प्रकाशन, कोल्हापूर.
69. शिंदे सुनिल व ढवळे जयराम, भारताचे शासन आणि राजकारण, एज्युकेशनल पब्लिकेशन्स ॲन्ड डिस्ट्रीब्यूटर्स, औरंगाबाद.
70. जोशी सुधाकर, भारतीय शासन आणि राजकारण, विद्या बुक पब्लिशर्स, औरंगाबाद.
71. गव्हाणे अजय, (२०१४), संसदीय लोकशाहीची आयुधे, क्रिएटिव्ह पब्लिकेशन्स, नांदेड.
72. मेहेत्रे डि. एच. व सोलापूरे राजशेखर, भारतीय शासन आणि राजकारण, अरुणा प्रकाशन, लातूर.
73. कारेकर मंजिरी व सुवर्णा बेनके, भारताचे शासन आणि राजकारण, पिअरसन पब्लिकेशन, नवी दिल्ली.
74. घांग्रेकर चिं. ग., (१९९७), भारतीय राज्यघटना : स्वरूप आणि राजकारण, श्रीमंगेश प्रकाशन, नागपूर
75. जाधव तुकाराम व महेश शिरपूरकर, (२०११), भारतीय राज्यघटना व घटनात्मक प्रक्रीया, युनिक अकॅडमी, पुणे.
76. संजय बी. गायकवाड ,सुनिल एस. ताकतोडे , भारतीय शासन एंव राजनीती ,रोशनी पब्लिकेशन ,२०१५

E-resources:
1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

VEC   End Semester Exam (ESE)

FACULTY OF ALL

Constitution of India

Question Paper Pattern

With effect from 2024-2025

Time: 02 Hrs.   Marks: 40

Note:

1. Question No.1 will be Compulsory

2. Students are required to solve a total of 04 questions

3. Students need to solve ANY THREE of the remaining Five questions (Q.02 to 06)

Q. 1   Write Short Notes   (All)   10   Marks

    A)

    B)

    C)

    D)

    E)

Q. 2   Descriptive question   10 Marks

Q. 3   Descriptive question   10 Marks

Q. 4   Descriptive question   10 Marks

Q. 5   Descriptive question   10 Marks

Q. 6   Descriptive question   10 Marks

Exam Pattern

VEC Exam Pattern

Constitution of India

C.A.   -   10 Marks

(Test I For 10 Marks, Test II For 10 Marks, One Assignment For 10 Marks

and Average of Test I + Test II + One Assignment For 10 Marks)

ESE -   40 Marks

(University theory exam for 40 Marks for descriptive Question)

GUIDELINES FOR COURSE ASSESSMENT:

A. Continuous Assessment (CA) (20% of the Maximum Marks):

This will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting **Two Tests and one Assignment.** Average of marks scored in these two tests and one assignment of a theory paper will make CA .

B. End Semester Assessment (80% of the Maximum Marks):

(For illustration we have considered a paper of 02 credits, 50 marks and need to be modified depending upon credits of individual paper)

1. **ESA Question paper will consists of 6 questions. Each of 10 marks for 2 Cr. pattern and 15 marks for 3 Cr. pattern. (BOS may change scheme of marking.)**

2. **There will be 4- 5 sub questions in Question No. 1**

3. **Question No.1 will be compulsory and shall be based on entire syllabus.**

4. **Students are required to solve a total of 4 Questions.**

5. **Students need to solve ANY THREE of the remaining Five Question (Q.2 to Q.6) and shall be based on entire syllabus.**

C. Assessment of Term Work/ Tutorial/Field Works:

At least 06 test / assignments covering entire syllabus must be given during the 'class wise tutorial'. The assignments should be students' centric and attempts be made to make assignments more meaningful, interesting and innovative.

Term work assessment must be based on overall performance of the student with every assignments graded time to time. The grades be converted to marks as per 'credit and grading system' manual and should be added and averaged.

Note: **Number of lectures required to cover syllabus of a course depend on number of credit assigned to it. For example, for a two credit course, 30 lectures each of one hour duration are assigned, while that for a three credit course 45 lectures.**

Environmental Science and Sustainability

SBCAVA1101	Environmental Science and Sustainability	2L:0T:0P	2 Credits

Course description:

This course aims to familiarize students with fundamental environmental concepts and their relevance to business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers. The course content is divided into four comprehensive units. Unit 1 introduces basic environmental principles, the man-environment relationship, and sustainability issues.

Unit 2 focuses on ecosystems, biodiversity, and sustainable practices.

Unit 3 addresses environmental pollution, waste management, and sustainable development strategies. Finally,

Unit 4 explores social issues, environmental legislation, and practical applications through hands-on fieldwork. Through this holistic approach, students will gain a deep understanding of environmental processes, the importance of sustainable practices, and their role in promoting sustainability within business contexts.

Course Objective(s):

1. This course aims to familiarize students with basic environmental concepts, their relevance to business operations, and forthcoming sustainability challenges.
2. This course will equip students to make decisions that consider environmental consequences.
3. This course will enable future business graduates to become environmentally sensitive and responsible managers.

Course Outcome(s):

1. Explore the basic environmental concepts and issues relevant to the business and management field.
2. Recognize the interdependence between environmental processes and socio-economic dynamics.
3. Determine the role of business decisions, policies, and actions in minimizing environmental degradation.
4. Identify possible solutions to curb environmental problems caused by managerial actions.
5. Develop skills to address immediate environmental concerns through changes in business operations, policies, and decisions.

Course Content:

Unit 1: Understanding Environment, Natural Resources, and Sustainability

Fundamental environmental concepts and their relevance to business operations; Components and segments of the environment, the man-environment relationship, and historical environmental movements. Concept of sustainability; Classification of natural resources, issues related to their overutilization, and strategies for their conservation. Sustainable practices in managing resources, including deforestation, water conservation, energy security, and food security issues. The conservation and equitable use of resources, considering both intergenerational and intergenerational equity, and the importance of public awareness and education.

Unit 2: Ecosystems, Biodiversity, and Sustainable Practices

Various natural ecosystems, learning about their structure, functions, and ecological characteristics. The importance of biodiversity, the threats it faces, and the methods used for its conservation. Ecosystem resilience, homeostasis, and carrying capacity, emphasizing the need for sustainable ecosystem management.

Unit 3: Environmental Pollution, E-Waste Management, and Sustainable Development

Various types of environmental pollution, including air, water, noise, soil, and marine pollution and their impacts on businesses and communities. Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; E-waste and their management.

Unit 4: Social Issues

Dynamic interactions between society and the environment, with a focus on sustainable development and environmental ethics. Role of businesses in achieving sustainable development goals and promoting responsible consumption.

Readings:

Text Books (Latest Editions):
- Poonia, M.P. *Environmental Studies* (3rd ed.), Khanna Book Publishing Co.
- Bharucha, E. *Textbook of Environmental Studies* (3rd ed.) Orient Blackswan Private Ltd.
- Dave, D., & Katewa, S. S. *Text Book of Environmental Studies.* Cengage Learning India Pvt Ltd.
- Rajagopalan, R. *Environmental studies: from crisis to cure* (4th ed.). Oxford University Press. ● Miller, G.T. & Spoolman S. *Living in the Environment*. (20th ed.). Cengage.
- Basu, M., & Xavier Savarimuthu, S. J. *Fundamentals of environmental studies*. Cambridge University Press.
- Roy, M. G. *Sustainable Development: Environment, Energy and Water Resources*. Ane Books.
- Pritwani, K. *Sustainability of business in the context of environmental management.* CRC Press.