Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Ref.No.SU/BOS/Science/271 **Date: 03/05/2025**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur.

Subject: Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper B.Sc. Part-II (Sem. III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc.Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	Pollution	8.	Food Science (Entire)
2.	Biochemistry	9.	Biotechnology (Entire)
3.	Food Science and Quality Control	10.	Environmental Science (Entire)
4.	Computer Science (Optional)	11.	Information Technology (Entire)
5.	Biotechnology (Optional/Vocational)	12.	Food Science and Technology (Entire)
6.	Animation (Entire)	13.	Food Technology & Management (Entire)
7.	Computer Science (Entire)	14.	All Faculty UG Part II Environmental Studies (VEC)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy Registrar
Dr. S. M. Kubal

Encl: As above

for Information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

SHIVAJ I UNIVERSITY, KOLHAPUR

NAAC A++ Grade with CGPA 3.52

Multiple Entry and Multiple Exit Option (NEP-2020)

Syllabus for

B.Sc. Computer Science (Entire)

(Under Faculty of Science and Technology)

PART-II SEMESTER- III & IV

(Syllabus to be implemented from Academic year 2025-26)

Multiple Entry and Multiple Exit Option (NEP-2.0)

B.Sc. Computer Science Entire Part-II (Level-5.0)

With Mathematics as Minor

SEMESTER-III(Duration- Six Month)										
Sr. No.	CourseCode	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam minutes	Maximum Marks	Minimum Marks	Exam minutes
1	**Subject I Major V:** Object Oriented Programming Using C++	2	-	2	40	14	90	10	04	20
2	**Subject I Major VI**: Database Concepts	2	-	2	40	14	90	10	04	20
3	**Subject I Practical IV:** Practical Based on Subject I Major V & Major VI	-	4	2	40	14	90	10	04	-
4	**Subject II Minor V:** Linear Algebra	2	-	2	40	14	90	10	04	20
5	**Subject II Minor VI** Numerical Methods	2	-	2	40	14	90	10	04	20
6	**Subject II Practical III:** Practical Based on Subject Minor	-	4	2	40	14	90	10	04	-
7	**OE– III(T):** Strategic IT Management	2	-	2	40	14	90	10	04	20
8	**VSC–I (P) Major Specific:** Web Technology (HTML & CSS)	-	4	2	40	14	90	10	04	20
9	**SEC-I(T):** Software Project Management / Statistics for Computer Science I	2	-	2	40	14	90	10	04	20
10	**AEC-I:** Formal Communication	2	-	2	40	14	--	10	04	20
11	**CC-I:** Basics of Yoga	2	-	2	40	14	90	10	04	20
	Total (A)			**22**	**440**			**110**		

SEMESTER-IV(Duration-Six Month)										
Sr. No.	**CourseCode**	**TeachingScheme**			**ExaminationScheme**					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Examinutes	Maximum Marks	Minimum Marks	Examinutes
1	**Subject II Major VII:** Data Structure With C++	2	-	2	40	14	90	10	04	20
2	**Subject II Major VIII**: RDBMS with PL-SQL	2	-	2	40	14	90	10	04	20
3	**Subject II Practical IV:** Practical Based on Subject II Major VII &MajorVIII	-	4	2	40	14	90	10	04	-
4	**Subject II Minor VII** Computational Geometry	2	-	2	40	14	90	10	04	20
5	**Subject II Minor VIII** Operation Research	2	-	2	40	14	90	10	04	20
6	**Subject II Practical VI:** Practical Based on Subject Minor	-	4	2	40	14	90	10	04	-
7	**OE– IV (T):** Enterprise Resource Management	2	-	2	40	14	90	10	04	20
8	**SEC-II (T):** Java Script / Statistics for Computer Science II	-	4*	2	40	14	2	10	04	-
9	AEC-II Soft skills	2	-	2	40	14	2	10	04	2
10	**VEC – II (T)** Environment Studies	2	-	2	40	14	2	10	04	2
11	CEP-I (P): Field Work	-	4	--	10	4	--	40	14	90
	Total (A)			**22**	**440**			**110**		

With Electronics as Minor

SEMESTER-III(Duration- Six Month)										
Sr. No.	**Course Code**	**Teaching Scheme**			**Examination Scheme**					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam minutes	Maximum Marks	Minimum Marks	Exam minutes
1	**Subject I Major V:** Object Oriented Programming Using C++	2	-	2	40	14	90	10	04	20
2	**Subject I Major VI**: Database Concepts	2	-	2	40	14	90	10	04	20
3	**Subject I Practical IV:** Practical Based on Subject I Major V & Major VI	-	4	2	40	14	90	10	04	-
4	**Subject II Minor V:** Computer Organization,	2	-	2	40	14	90	10	04	20
5	**Subject II Minor VI** Electronic Communication	2	-	2	40	14	90	10	04	20
6	**Subject IIPractical III:** Practical Based on Subject Minor	-	4	2	40	14	90	10	04	-
7	**OE– III(T):** Strategic IT Management	2	-	2	40	14	90	10	04	20
8	**VSC–I (P) Major Specific:** Web Technology (HTML&CSS)	-	4	2	40	14	90	10	04	20
9	**SEC-I(T):**Software Project Management	2	-	2	40	14	90	10	04	20
10	**AEC-I:** Formal Communication	2	-	2	40	14	--	10	04	20
11	**CC-I:**NSS/NCC/Cultural	2	-	2	40	14	90	10	04	20
	Total (A)			**22**	**440**			**110**		

SEMESTER-IV(Duration-SixMonth)										
Sr. No.	**Course Code**	**Teaching Scheme**			**Examination Scheme**					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Examinutes	Maximum Marks	Minimum Marks	Examinutes
1	**Subject II Major VII:** Data Structure With C++	2	-	2	40	14	90	10	04	20
2	**Subject II Major VIII**: RDBMS with PL-SQL	2	-	2	40	14	90	10	04	20
3	**Subject II Practical IV:** Practical Based on Subject II Major VII &Major VIII	-	4	2	40	14	90	10	04	-
4	**Subject II Minor VII** Computer Networking	2	-	2	40	14	90	10	04	20
5	**Subject II Minor VIII** Micro-Controller &Interfacing	2	-	2	40	14	90	10	04	20
6	**Subject II Practical VI:** Practical Based on Subject Minor	-	4	2	40	14	90	10	04	-
7	**OE– IV (T):** Enterprise Resource Management	2	-	2	40	14	90	10	04	20
8	**SEC-II (P):** Java Script	-	4*	2	40	14	2	10	04	-
9	AEC-II Soft skills	2	-	2	40	14	2	10	04	2
10	**VEC – II (T)** Environment Studies	2	-	2	40	14	2	10	04	2
11	CEP-I (P): Field Work	-	4	--	10	4	--	40	14	90
	Total (A)			**22**	**440**			**110**		

• **OE:** Open Elective	• **SEC:** Skill Enhancement Course
• **VSC:** Vocational Skill Course	• **AEC:** Ability Enhancement Course
• **CC:** Co-Curricular Course	• **CEP:** Community Engagement Program

B.Sc. Computer Science [Entire] (Semester–III)(NEP2.0)(Level–5.0)

Course: Subject I Major V

Course Title: Object Oriented Programming Using C++

Total Contact Hours: 30Hrs. (30 Lectures of 60 minutes)

Teaching Scheme: Theory- 02 Lectures/Week **Marks:** 50 **Credits:**02

Course Outcomes: After completion of this course student should be able to

1. Understand basic concepts of object-oriented programming.
2. Design classes and objects and Abletouse construct or and destructor.
3. Utilize the OOP techniques like operate or overloading, inheritance, and polymorphism.

UNIT	Contents	HoursAllotted
1	**Object Oriented Concepts:** • DifferencebetweenPOPand OOP. • Concepts of OOP- Data abstraction, Encapsulation, Inheritance, Polymorphism. • Basics of C++,Terminology: Tokens, Keywords, Identifiers, constants. • Basic data types, Structure of C++program, Input and output streams. • Operators in C++,Dynamic Memory allocation(New &Delete),this pointer. • Dynamic initializationofvariable, reference variables, default argument. • Control structures: Branching and looping statements. **Class,Object and Functions**: • Classes and objects-Definitions, defining class, Defining member functions within class and outside class, Nesting of member functions, static data members, static member function • Access modifiers: private, public and protected. • Array of objects, object as function argument, returning objects. • Inline function, Friend function and friend class.	**15**
2	**ConstructorandOperatorOverloading**: • Constructor: Definition, types-Default Constructor, Copy constructor, Parameterized constructor, Multiple constructors in class, constructor with default argument. • Destructors. • Operatoroverloading**:** Definition, Rules foroverloading operator, overloading unary and binary operators. • Overloading operator using friend function. **InheritanceandPolymorphism** • Inheritance**:** Introduction, Defining base and derived class. • Single Inheritance, Making private ember inheritable, • multiple Inheritance, multilevel Inheritance, hierarchical Inheritance, hybrid Inheritance, • AbstractClass,Constructorsinderivedclass • Polymorphism**:** Definition, Typesofpolymorphism: CompileTime Polymorphism, Run Time Polymorphism Virtual function.	**15**

TextBook/Referencebook:

1. Object oriented programming ByE.Balagurusamy.
2. C++Programming–By D.Ravichandran
3. Let Us C++ By Yashwant Kanetkar.
4. Object Oriented Programming in C++-Dr.G. T.Thampi, Dr. S.S. Mantha
5. Mastering C++- By Venu gopal

B.Sc.ComputerScienceEntire(Semester–III)(NEP2.0)(Level–5.0)

Course: Subject I Major VI
Course Title: Database Concepts
Total Contact Hours: 30Hrs.(30 Lectures of 60 Minutes)
Teaching Scheme: Theory –02 Lectures/Week **Marks:**50 **Credits:**02

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,students willable to:

1) Describe the basic concepts of DBMS and various databases used in real applications.
2) Demonstrate the principles behind systematic database design approach.
3) Describe the fundamental elements of Relational Database Management Systems.
4) Use various commands in data languages with example.

UNIT	Contents	HoursAllotted
01	**Basics of RDBMS** • Characteristics of database approach, advantages and disadvantages of DBMS, Data models: Hierarchical, Network, Relational, Schema and Instances, • DBMS architecture: Three Schema Architecture, Internal, Conceptual,External,Dataindependence:Logical,Physical, Concept of RDBMS, • Terminologies:relation,attribute,domain,tuple,entities, • IntegrityConstraints(Domain,Entity,Referential), • EntityRelationship Model, EntityRelationships: one-one, one-many,many-one,many-many,Key:Superkey,CompositeKey, CandidateKey, PrimaryKey, AlternateKeyorSecondaryKey, Foreign Key), • Normalization:1Nf,2NF,3NF,De-normalization,Relational algebra	15
02	**BasicsofMySQL** • Features of MySQL, Data types, User management, Database (Create, Use, Drop, Show, Copy), • DDL,DML, DCL,TCLCommands, • Clauses– Orderby,whereandgroupby, • Operators:Arithmetic(DIV,/, -,+,*,%,MOD),Comparison operator (=, <>, >, <, >=,<=), • Set operators : Union, Union all, Intersect, Minus Other Operator:like,in,not,between,exists,all,any,isnull,isnot null, distinct	15

ReferenceBooks:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition ,Pearson Education, 2010.
2. R.Ramakrishanan, J.Gehrke,Database Management Systems 3rdEdition,McGraw-Hill,2002.
3. A.Silberschatz ,H.F. Korth,S. Sudarshan, Database System Concepts6thEdition, McGraw Hill, 2010.
4. R. Elmasri,S.B. Nava the Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.
5. Database System Concept– Silberschatz ,Korth

B.Sc. Computer Science (Entire)(Part-II)(Semester-III)(NEP)
Major Practical- III

Computer Science Practical based on Major V and VI

Lab Course based on C++ and DBMS

Credits: 02 Teaching Scheme: Practical – 4 Lectures/Week/batch Total Marks: 50

List of Practical:

Following is a sample list of assignments for practical, in structures are advised to provide more lab assignments to students to meet the course specified outcomes

Practical's: Lab Course based on Subject I Practical III: Practical Based on Subject I Major V& Major VI

B.Sc.ComputerScience(Entire)(Part-II)(Semester-IV)(NEP) Practical-I, (C++andDBMSPractical basedonMiner VII & VIII)	
Sr. No.	**Nameofthe Practical**
1	Write a C++programs based on branching and looping statements.
2	Write a C++programs based implementation of class having data member, member function inside the class.
3	Write a C++ programs based on implementation of class having data member ,member function outside the class
4	Write a C++ programs based on nesting of member function.
5	Write a C++ programs based on array of object.
6	Write a C++ programs based on passing object as Parameter
7	Write a C++ programs based on returning object
8	Write a C++ programs based on static data members and static member function
9	Write a C++programs based on programs based on usage of construct or with its types
10	Write a C++ programs based on destructor
11	Write a C++ programs based on usage of Inline and friend function
12	Write a C++ programs based on implementation of Single Inheritance
13	Write a C++ programs based on usage of constructors in derived class
14	Write a C++ programs based on implementation of multilevel Inheritance
15	Write a C++ programs based on implementation of multiple Inheritance
16	Write a C++ programs based on implementation of hierarchical Inheritance
17	Write a C++programs based on implementation of hybrid Inheritance
18	Write a C++ programs based on implementation off unction overloading
19	Write a C++programs based on implementation unary, binary operate or overloading
20	Write aC++programsbasedonimplementationoverloadingoperatorsusingfriendfunction
21	Write a C++ programs based on implementation of run time polymorphism i.e., virtual function
22	Write a C++ programs based on implementation of Abstract Class

- **Practical Based on Course: Subject I Major VI- DBMS**

Following is as list of assignments for practical, in struct or s are advised to provide more lab assignments to students to meet the course specified outcomes.

1	A practical on create, use and drop database.
2	A practical on DDL commands– Create table, Alter table: Add, modify, drop, rename column, rename table using first/after; Drop, Rename, Truncate)
3	A practical on DML commands–insert record, update record, select and delete record
4	A practical on creating table and use of different constraints on table. Insert at least10 records
5	A practical on user management in My SQL
6	A practical on DCL commands –Grant, Revoke
7	A practical on TCL commands–Rollback, Commit, Save Point

B.Sc. Computer Science (Entire) (Part-II)(Semester-III) (NEP2.0)(Level–5.0)
Course III, Minor V
Course Title: Computer Organization,
Total Contact Hours: 30 hrs. (30 lectures of 60 min.)
Credits: 02 Teaching Scheme: Theory–2Lectures/Week Total Marks:40

Course Outcomes (COs): On completion the course ,the students will be able to

1) Understand and the designing of Combinational circuits & Sequential circuits,
2) Understand the Internal organization of Memory,
3) To study and under and the Input & Output devices organization in a computer,
4) To study the architecture CPU & internal organization of CPU

Units	Contents	Hours
1.	**A) Digital System Design:** **Combinational circuits design**: Design of Full Adder, Full Sub tractor, Design of Binary to Gray code converter, Gray to Binary code converter,Designof1-bit&2- bit Digital Comparator or (i.e. Magnitude Comparator), **Sequential circuit design:** Excitation ables of different Flip-flops, Design of 2-bit Synchronous Up counter or Down counter by using JK flip-flops or T-flip-flops, Design of 3-bit Non-sequential Counter (i.e. Random sequence Counter), **B) Memory Organization:** Classification & Characteristics of memory systems, Internal organization of RAM memory & ROM memory, Memory map, **Memory Expansion**: Horizontal memory expansion with example, Vertical memory expansion with example, Memory interfacing diagrams with CPU, Cache memory, Cache memory mapping techniques, Virtual memory &Swapping process, Paging technique & Segmentati on technique, Comparison between Paging & Segmentation,	15
2.	**A) Input/Output Organization:** I/O devices, System bus, I/O bus, Addressing methods: I/O mapped I/OIsolated I/O) & Memory mapped I/O, Comparison between I/O mapped I/O & Memory mapped I/O, **I/O interfaces:** Internal block diagram of Parallel I/O interface, Internal block diagram of Serial I/O Interface (i.e. **UART**),Internal block diagram of **DMA controller,** DMA I/O data transfer with the interfacing diagram of DMA controller with the CPU**,** IO Pprocessor,Interfacing diagram between IO Pprocessor & Master CPU, **B) CPU Organization:** Functions of CPU, Internal block diagram of CPU, Control unit: Introduction of Hard wired control unit& Micro-programmed control unit, **RISC&CISC** Architecture CPU, Comparison between RISC& CISCCPU, Pipelining technique inside the CPU, Combinational ALU, Sequential ALU, Internal Organization of CPU: Accumulator based CPU, Register based CPU,Stack based CPU	15

Reference Books:

1. Computer Organization,by J. P. Hays,
2. Digital System Design ,by Techmax/ Niralipublication,

3. Computer System Architecture by Morris Mano,

B.Sc. Computer Science (Entire) (Part-II) (Semester-III)(NEP)
Course III Minor VI
Course Title: Electronic Communication
Total Contact Hours: 30 hrs. (30 lectures of 60min.)
Credits: 02 Teaching Scheme: Theory–2Lectures/Week TotalMarks:40

Course Outcomes (COs):

On completion of the course, the students will be able to:

1) Understand the concept of Electronic communication,
2) Understand Different Modulation techniques,
3) Understand Different Multiplexing techniques,
4) Understand wireless telecommunication systems.

Unit	Contents	Hours
1	**A) Introduction to Electronic Communication Systems:** Block diagram of Electronic communication system, Electromagnetic spectrum ,Types of Electronic communication, Applications of different Communication system, Noise signal , types of Noise signal, Signal to Noise ratio, Signal bandwidth, Channel bandwidth, Nyquist Sampling theorem, Shannon's the orem for channel capacity, **B) Analog Modulation:** Need of modulation, classification on of modulation techniques, Baseband signal, carrier signal, Modulation, demodulation, Analog modulation: **Amplitude modulation** & demodulation , Representation of AM signal in Time domain &Frequency domain, Modulation index,Equation of A Msignal, Power distribution in AM signal,**Frequency Modulation** & Demodulation, Representation of FM signal in time domain & frequency domain, Modulation index, Comparison between AM & FM modulation	15
2	**A) DigitalModulation&Multiplexing:** Classification of Pulse modulation: PAM, Pulsecode modulation (PCM), Delta modulation, block diagrams & working of each, Digital modulation: ASK, FSK, PSK, Block diagram of FSK-MODEM, **Multiplexing:** Time division multiplexing, frequency division multiplexing, Code division multiplexing, **B) WirelessCommunication:** Introduction to mobile communication, Cellular concept, Working of GPS, Handover mechanism in mobile communication, Introduction to GPRS, **WirelessProtocols:**RFID,ZigBee,BlueTooth&WiFiprotocols,Compariso n between these wireless protocols,	15

ReferenceBooks:

1. Electronic Communication by Roddy Coolen,
2. Electronic Communication by Robert Kennedy,
3. Communication Electronics by L.E.Frenzel,

B.Sc.ComputerScience(Entire)(Part-II)(Semester-III)(NEP)
Minor Practical- III
Electronics Practical based on Computer Organization and Electronic Communication
Credits:02Teaching Scheme:Practical–4Lectures/Week/batch
TotalMarks:50

Sr. No.	Nameofthe Practical
1	Study of Amplitude Modulation & Demodulation
2	Study of Frequency Modulation & Demodulation,
3	Study of ASK Modulator & Demodulation,
4	Study of FSK Modulation & Demodulation
5	Study of PAM modulation &Demodulation
6	Study of PWM modulation &Demodulation
7	StudyofPulsecodeModulation& Demodulation
8	Study of BPSK modulation &demodulation
9	Study of 2 bit Synchronous Up& Down counter,
10	Study of 4 bit Asynchronouscounter
11	Study of Binary to Gray & Gray to Binary code convertor
12	Study of 1 bit Digital Comparator
13	StudyofSchmittTriggerbyusingOPAMP
14	Study of Integrator &Differentiator, by using Op-Amp
15	Study of 3 bit flash ADC circuit
16	Study of LDR based light control system
17	Study of architecture of Motherboard of Computer
18	Study of Passive filters &Active filters using Op-Amp
19	Study of wave for mgenerations using Op Amp,
20	Study of Oscillators using Op-Amp,

B.Sc. Computer Science (Entire) Part-II (Semester III)

Course III: Minor V

Course Title: Linear Algebra

Total Contact Hours: 30 hrs. (30 lectures of 60 min)

Credits:02 Teaching Scheme:Theory–02Lectures/WeekTotalMarks:50

Course Outcomes: After complete on of this course, student should be able to

1. Understandtheconceptoflineartransformationanditsapplicationtoreallifeapplications.
2. Evaluate mathematical expressions to compute quantities that deal with linear systems and Eigen value problems.
3. Analyze an the matical statements and expressions.
4. Reasonmathematically.Understandthenotionofvectorspace,subspace,basis.

UNIT	CONTENTS	HOURS ALLOTTED
1	**LinearEquationsandMatrices:** 1.1 Matrices 1.2 MatrixTransformation 1.3 Linear Systems 1.4 Resultsonsystemoflinearequationsandinvertible matrices 1.5 SolutionsofSystemofLinearEquations 1.5.1 GaussElimination Method 1.5.2 Gauss-JordonMethod 1.6 **Eigenvalues, Eigenvectorsand diagonalization** 1.6.1 EigenvaluesandEigen Vectors 1.6.2 Diagonalization 1.6.3 Cayley-Hamiltoniantheorem(StatementOnly)andExamples	15
2	**Vector Space:** 2.1 VectorSpace 2.2 Sub Space 2.3 LinearDependentandIndependent 2.4 LinearSpan 2.5 Basisand Dimension 2.6 DefinitionandExamples ofInnerProductSpace 2.6.1. DefinitionandExamples 2.6.2. PropertiesofInnerProductSpace 2.6.3. OrthonormalBasisinR 2.6.4. Gram-SchmidtProcess	15

***Note:** All theoremsinsections1.4, 1.6,2. 5 ,2. 6 are without proof.

Recommended Book:

Elementary Linear Algebra with Applications , Howard Anton,ChrisRorres,JohnWileyandsons.,7th Edition (1994).

REFERENCEBOOKS:

1. A textbook of Matrices ,Shanti Narayan, P.K.Mittal,S. Chand.
2. To pics in Algebra,I. N.Herstein.
3. Linear Algebra,SchaumSeries.

B.Sc. Computer Science (Entire)Part-II (Semester III)

Course VI Minor VI

Course Title: Numerical Methods

Total Contact Hours: 30 hrs. (30 lectures of 60 min)

Credits:02 Teaching Scheme:Theory–02Lectures/WeekTotalMarks:50

Course Outcomes: After completion of this course ,student should be able to

1. Understand how to find the roots of transcendental equations.
2. Understand learn numerical solution of differential equations
3. Understand how to find the roots of transcendental equations.
4. Understand how to interpolate the given set of values.

UNIT	CONTENTS	HOURS ALLOTTED
1	**SolutionofNon-linearEquationsandNumericalInterpolation** 1.1 Introduction 1.2 Bisection method: Algorithm, graphical presentation and examples. 1.3 Regula– Falsimethod: Algorithm, graphical representation and examples. Newton Raphs on method: Algorithm, graphical presentation, examples. 1.4 Interpolation, Equally and Unequally spaced data. 1.5 Definition of Forward Difference(Δ),B awkward Difference(∇)and Shift Operator (E). 1.6 ElementaryresultsofΔ,∇, E. 1.7 Fundamental the orem of difference calculus(with proof). 1.8 Newton-Gregory Forwar dinterpolation formula(with proof)&Examples 1.9 Newton-Gregory Backwar dinterpolation formula(with proof)&Examples 1.10 Lagrange' sinterpolation formula(with proof)and example	15
2	**NumericalIntegration** 2.1 Introductionofnumericalintegration. 2.3GeneralQuadrature formula (with proof). 2.3 Trapezoidalrule (with proof)and examples. 2.4 Simpson's1⁄3rule (with proof)and examples. 2.5 Simpson's3⁄8rule (with proof)and examples. 2.6 Weddle'srule (with proof)and examples.	15

RecommendedBook:

1. IntroductoryMethodsofNumericalAnalysis,S.S.Sastry,3rdedition, Prentice Hallof India, 1999.
2. Finite difference sand Numerical Analysis,H.C. Saxena,S. Chandand Company.

REFERENCE BOOKS:

1. NumericalAnalysis,Balguruswamy.
2. CalculusofFiniteDifferencesandNumericalAnalysis,P.P.Gupta,G.S.MalikandS. Gupta,Krishna Prakashan Media (P) Ltd.
3. Computer oriented Numericalmethods, A.B.AutiTech-maxpublications.

B.Sc.ComputerScience(Entire)(Part-II)(Semester-III)(NEP)
Minor Practical- III

Mathematics Practical based on Minor V and VI

Course– basedonLinearAlgebraandNumericalMethods

Credits:02 Teaching Scheme:Practical–4Lectures/Week/batch TotalMarks:50

List ofPractical:

Practical Number	Titleofthepractical
1	Gauss Eliminati onMethod and Gauss-Jordon Method
2	Eigen values and Eigenvectors, Diagonalization
3	Verification of Cayley-Hamiltontheorem
4	Inverse of a matrix using Cayley-HamiltonTheorem
5	Examples on Basis of Vector Space
6	GramSchmidtprocess
7	Bisection method
8	Newton Forward and Backwardinterpolation,Lagrange'sinterpolation
9	Trapezoidal,Simpson's1⁄3andSimpson's3⁄8rule
10	Weddle's rule
11	Regula-FalsiMethodandNewtonRaphsonmethod
12	ComputerProgramfor 1) Trapezoidalrule 2) Simpson1⁄3ruleand Simpson3⁄8 rule 3) Weddle'srule 4) Bisectionmethod,Regula-FalsiMethodandNewtonRaphson method

B.Sc. Computer Science[Entire](Semester–III)(NEP2.0)(Level–5.0)

Open Elective (OE) - III

Course Title: Strategic IT Management

TeachingScheme:Theory:02Lectures/Week **TotalMarks:**50 **Credits:**02

Course Outcome

Aftercompletionofthiscoursestudentswillbeableto–

1. UnderstandbusinessstrategyandITalignment.
2. DevelopplanforITstrategyforanyorganization.
3. UnderstandITsourcingstrategyfortheorganization.

UNIT	Contents	HoursAllotted
01	**BusinessStrategyandIT:** • Introduction of business strategy-Challenges and opportunities, establishing principles. • IT Strategy- Applications strategy, Data and Technology management strategy for IT, strategy for programs, project and portfolio management, IT service management strategy. • DevelopingITstrategyforcompetitiveadvantage. • Business and IT alignment, challenges of IT and business strategy alignment.	15
02	**StrategicITPlanning(SITP):** • Introductionofstrategicplan, process, difficultiesindevelopingand executing SITP, SITP approaches, content of SITP, • Resourceplanning, **IT Governance**: Definition and Purpose of IT Governance, Areas of IT Governance- strategic alignment, Value Delivery, Risk Management, Resourcemanagement,Performancemeasurement.ChallengesinIT Governance	15

ReferencesBook:

1. ITstrategyandManagementbySanjivaDubey,ForthEdition,PHILearningPrivateLimited,Delhi,2018
2. ITGovernance,PeterWeillandJeanneWRoss, HarwardBusinessSchoolPress
3. Strategies forInformationTechnologyGovernance,WimVanGrembrgen,IdeaGroupPublishing
4. ITGovernance,MartinFrohlichandKartGlasher,GablerPublication5.ITGovernance,APracticalGuideby Christopher BGillies

B.Sc. Computer Science[Entire](Semester–III)(NEP2.0)(Level–5.0)

Course: Value Education Course (VEC) - I

Course Title: HTML& CSS(Web Technology)

Teaching Scheme: Practical 04 Lectures/ Week **TotalMarks:**50 **Credits:**02

CourseOutcomes:

Studentswhocompletethiscourseshouldbeableto:

1. UnderstandbasicaswellasadvancedconceptsofHTML
2. UnderstandbasicsofCSSto designapage.
3. DesignanddevelopwebsiteusingHTMLandCSS

UNIT	Contents	HoursAllotted
01	**INTRODUCTIONTOHTML** • Introduction,ElementsofHTML • Advantages and Disadvantages of HTML • Basic structure ofHTML,HTMLTags–Tagsandattributes • BasicHTMLtags, HTMLheadingsandparagraphs • Text formatting tags-<b>,<i>,<u>,,,<small>, <ins>,<del>,<sub>,<sup>	15
	INTRODUCTIONTOCSS • Introductionto CSS,FeaturesofCSS,BasicsofCSS • Understanding the syntax of CSS, Types of Style Sheets–Inline Style, Internal or Embedded Style, External or Linked Styles.	
02	**ADVANCED HTML** • Creating links in HTML ,Images in HTML, Tables in HTML • Lists in HTML, Frames in HTML Forms in HTML-Form tag, Input tag, Select tag.	15
	FORMATTINGUSINGCSS • FormattingTextandFonts • FormattingcolorsandBackgrounds • CSSBorders,Marginsandpaddings • CSSSelectors–Group,Id, Class.	

TextBooks/ReferenceBooks

4. TeachYourselfWebTechnologies–IvanBayross,BPBPublications
5. WebTechnology–RameshBangia
6. HTML4Unleashed-SecondEdition-RickDranell
7. HTML&CSS:TheCompleteReference-FifthEdition–ThomasA.Powell
8. HTML5&CSS 3-SeventhEdition–Castro ElizabethandBruceHyslop
9. HTMLBlackBook–StevenHolzner

Practical:LabCoursebasedonVEC-1:WebTechnology(HTML&CSS).

1	Designawebpageusingheadingandtextformattingtagsin HTML
2	Designawebpageusingimageandlinktagsin HTML
3	Designawebpageusingframetagin HTML
4	Createyour classtimetableusingtabletaganditsattributesin HTML
5	Createaform forstudentadmission/studentfeedbackbyusingformtaganditsattributesin HTML
6	Designwebpage/sofyourCollege/Departmentwithanattractivebackground,textcolor,images and fonts by using CSS properties
7	Designwebpage/sofyourcitybyusinginline,internalandexternalCSS
8	Designwebpage/sfordisplayofonlineproductsbyusingCSS andCSSselectors

B.Sc.ComputerScience[Entire](Semester–III)(NEP2.0)(Level–5.0) Skill Enhancement Course (SEC) - I

CourseTitle: SoftwareProjectManagement

Teaching Scheme: Theory-02Lectures/Week **TotalMarks:**50 **Credits:**02

Course Outcomes:

Aftersuccessfulcompletionofthiscourse,studentswillable to:

1) UnderstandtheFundamentalsofSoftwareProjectManagement.
2) Apply Project Planning, Scheduling ,and Risk ManagementTechniques.
3) Implement Software Configuration Management (SCM)andQualityAssurance(SQA)Practices
4) UtilizeAgileMethodologiesandModernProjectManagement Tools

Unit	Contents	HoursAllotted
1	**IntroductiontoSoftwareProjectManagement** **Basics of Project Management** ● Definition& importance ● Factorsinfluencingprojectmanagement ● Roles&responsibilitiesofaprojectmanager ● Projectdevelopmentphases **Project Planning(5hours)** ● Tasksinprojectplanning ● Planningmethods ● EffortEstimationTechniques:COCOMO,FunctionPoint Analysis (FPA), ● WorkBreakdownStructure(WBS) **ProjectScheduling&RiskManagement** ● Schedulingtechniques(GanttCharts,PERT,CPM) ● RiskManagementinSoftwareProjects: ○ Riskidentification&assessment ○ RiskMitigation,Monitoring,andManagement(RMMM) **AgileProject Management** ● PrinciplesofAgile ● IntroductiontoAgileFrameworks:Scrum&Kanban ● ScrumFramework(roles,events,artifacts) ● Kanbanvs. Scrum	**15**
2	**ProjectMonitoring,Control,SCM,SQA Project Monitoring & Control** ● Projectstatusreporting ● Projectmetrics ● Projectcommunicationplan&techniques ● Processimprovementsteps **SoftwareConfigurationManagement(SCM)** ● Baselines&SoftwareConfigurationItems (SCI) ● SCMProcess	**15**

	● Version Control&ChangeControl(Git,GitHub,SVN) ● ConfigurationAudit&StatusReporting **SoftwareQualityAssurance(SQA)** ● SQAactivities(reviews, audits,testing) ● Softwarequalityattributes ● Softwarequalitystandards(ISO 9001,ISO12207, CMMI) **Modern Tools& EthicsinProjectManagement** ● ProjectManagementTools:JIRA,Trello,MicrosoftProject ● VersionControl&CI/CDTools:Git,Jenkins,GitHubActions ● SoftwareTesting&QATools:Selenium,SonarQube ● Ethics&ProfessionalisminProjectManagement ○ IEEE&ACM CodeofEthics ○ Dataprivacy,security,andcompliance	

ReferenceBooks:

1. "SoftwareProjectManagement"–BobHughes,MikeCotterell,RajibMall
2. RogerSPressman,BruceRMaxim,“SoftwareEngineering:APractitioner’sApproach”
3. "AppliedSoftwareProjectManagement"–Stellman&Greene
4. "AgileProjectManagementwithScrum"–KenSchwaber
5. "SoftwareQualityAssurance"–DanielGalin

B. Sc. Computer Science (Entire) Part- II (Semester III)
Course Code: SEC-I: Skill Enhancement Course
Course Title: Statistics for Computer Science I
Credits: 02, Total Marks: 50
Teaching Scheme: Theory: 02 Lect. / Week

Course Outcomes:

After completion of this course students should be able to

1. Understand basics of univariate random variable and probability distribution.
2. Understand common discrete probability distributions like Uniform, binomial, Poisson distribution.
3. Analyze data effectively using different probability distributions.
4. Get insight to apply standard discrete probability distributions to different situations.

Unit	Contents	Hours Allotted
1.	1.1 Introduction to statistical experiment (deterministic and non-deterministic), random experiment, sample space (finite & countably infinite), events and its types, random variable (r.v.), discrete random variable and its real-life examples. 1.2 Concept of probability, Classical definition of probability, Axiomatic definition of probability, Theorems on probability: i) $P(\varphi) = 0$, ii) $P(A') = 1 - P(A)$, iii) if $A \subseteq B$ then $P(A) \leq P(B)$, Conditional probability, independent events (for 2 and 3 events), theorems on independence of two events: if A and B are independent then, i) A and B^c are independent, ii) A^c and B are independent, iii) A^c and $B^c$are independent., Union rule for i) any two events, ii) for independent events, iii) for exclusive events, Multiplication rule, Baye's theorem, Illustrative examples.	**15**
2.	2.1 Probability distribution of discrete r.v. (p.m.f.), cumulative distribution function of r.v. (c.d.f.), expectation and variance of discrete random variable, properties of c.d.f., graph of p.d.f. and c.d.f.Illustrative examples. 2.2 Standard Discrete Prob. Distributions: Introduction to random experiments with special reference to computer science, Discrete Uniform Distribution: definition of p.m.f., real life examples, c.d.f., mean and variance.	**15**

	Binomial distribution: Bernoulli trials, definition of p.m.f., real life examples, c.d.f., mean and variance, recurrence relation. Poisson distribution: definition of p.m.f., real life examples, c.d.f., mean and variance, recurrence relation,Illustrative examples.	

References and Recommended Readings:

1. Parimal Mukhopadhyay: An Introduction to the Theory of Probability. World Scientific Publishing.
2. Hogg R. V. and Criag A.T.: Introduction to Mathematical Statistics (Third edition), Macmillan Publishing, New York.
3. Gupta S. C. & Kapoor V.K.: Fundamentals of Mathematical Statistics. Sultan Chand & sons, New Delhi.
4. Goon, A.M., Gupta M.K. and Dasgupta B: Fundamentals of Statistics Vol. I and Vol. II World Press, Calcutta.
5. Mood A.M., Graybill F.A.: Introduction to theory of Statistics. (Chapter II, IV, V, VII) and Boes D.C. Tata, McGraw Hill, New Delhi. (Third Edition)
6. Walpole R.E. & Mayer R.H.: Probability & Statistics. (Chapter 4, 5, 6, 8, 10) Mac Millan Publishing Co. Inc, New York.

B.Sc. ComputerScience [Entire](Semester–III)(NEP2.0)(Level–5.0) Skill Enhancement Course (AEC) - I

CourseTitle: Formal Communication

Teaching Scheme: Theory-02Lectures/Week **TotalMarks:**50 **Credits:**02

Course Outcomes:

After successful completionofthiscourse,studentswillable to:

1. Introduce communication techniques
2. Have professional correspondence techniques
3. Enhance writing skills

Unit	Contents	HoursAllotted
1	Communication: Nature and Importance of Communication, Objectives of Communication, Importance of Communication, Process and barriers to Communication, Elements of Communication, Forms of Communication Verbal Communication Techniques: Art of Speaking, Speech Styles. Oral Presentation- Preparation of Formal Speech, Meetings, Interviews, Group Discussion, Debate, Elocution, Extempore.	15
2	Non-verbal Communication-Meaning, Characteristics & classification of Non-verbal Communication, Body Language, Gestures, Postures. Listening & observation skills. Rapid review of Grammar:- Corrections of common errors, Verb and its subject, forms of verb, Use of phrases and idioms, Use of infinitive Gerund and Participle, Errors & Use of Adjective and adverb, Punctuation and capitalisation.	15

Reference Books:

1. R.K. Chaddha Communication Techniques and skills – DhanpalRai Publication, NewDelhi.
2. Pravil S. R. Bhatia, Professional Communication Skills- S. Chand and Co.,NewDelhi.
3. J.D.O'Connor, Better English pronounciation.
4. Wren and Martin, Highschool English Grammer and Composition – Chand and Co.,New Delhi.

B.Sc. ComputerScience [Entire](Semester–III)(NEP2.0)(Level–5.0) Skill Enhancement Course (CC) - I

Course Title: Basics of Yoga

Teaching Scheme: Theory-02Lectures/Week **TotalMarks:**50 **Credits:**02

Course Outcomes:

After successful completion no this course, students willable to:

1. To understand the importance of Yoga
2. To understand various Asans

Unit	Contents	HoursAllotted
1	Yoga Definition, Objectives of yoga Education Difference between Yoga Asana, and physical exercises, Importance of Yoga in daily life, Methods and benefits of Asanas, Pranayama and Concentration, Knowledge of five yama with more emphasis on 'Asteya', Knowledge of five Niyama with emphasis on 'Santosh', Knowledge of Aahar-Vihar, Methods and benefits of Sukshma,Vyayama, Asanas and prayers. Types of Yoga: Jnana Yoga, Bhakti Yoga, Karma Yoga, Hatha Yoga,Raja Yoga.	15
2	Role of yoga in character building, Therapeutic values of yoga, Introduction of yoga literature, Life history of Arvindo, Vivekanand and other yogis, Knowledge of Bandha, Mudra and Chakras,Methods and benefits of Asans, Pranayama and Concentration Effects of Asanas and Pranayama on physiology of human body, Concept of Nishkama Karma Yoga, Role of Yoga practices in developing concentration, will power and discipline, Techniques of stress management, Methods and benefits of Asanas, Pranayama and concentration.	15

References:

1. Light on Yoga by B.K.S. Iyengar
2. The Yamas & Niyamas: Exploring Yoga's Ethical Practice by Deborah Adele

B.Sc. Computer Science [Entire](Semester–IV)(NEP2.0)(Level–5.0) Course:
Subject I Major VII
Course Title: Data Structure with C++
TotalContactHours:30Hrs.(30Lecturesof60Minutes)
TeachingScheme:Theory–02Lectures/Week **Marks:**50 **Credits:**02

CourseOutcomes: Aftercompletionofthiscourse, studentwillbeto

- Understandconceptofdata structureandconceptofarrayoperationsand applicationsofarray.
- Understanddifferentsortingandsearchingalgorithms forproblemsolving.
- Implementsalgorithmstosolveproblemsusingappropriatedatastructures.
- Understandimplementationsoflinkedlistand basicsofTrees.

UNIT	Contents	HoursAllotted
01	**ConceptsofDatastructure and Array** • ConceptofData,DataObject,TypesofData-AtomicData,Non-atomic Data • DefinitionofDataStructure,typesofDataStructureandadvantages of Data Structure. • Arrayindatastructure,representationofarray, memoryallocationof an array, multi-dimensional array **AlgorithmAnalysis** • Spacecomplexity,timecomplexity • Asymptoticnotation(BigO,OmegaΩ,ThetaΘ) • Searchingalgorithms-Linearsearch,binarysearchandtheir algorithms • Sortingalgorithm-BubbleSort,insertionsort,selectionsort,quicksort and their algorithms.	**15**
02	**StackandQueue** • **Stack**:ConceptofStack:Definition,workingofstack Operations onStack: push, pop,peek, ArrayimplementationofStack, Linked List implementationofStack,ApplicationsofStack-Recursion, Infix, Prefix, Postfix, conversion from Infix to Prefix and Infix to Postfix • **Queue**: Conceptsofqueue: Definition, working of queue, Operations onQueue:Insert,Delete,peek,Arrayimplementationofqueue,Linked List Implementation of Queue, Types of Queue-Linear, Circular and Priority, Applications of Queue. **LinkedListandTree** • **LinkedList**:ConceptofLinkedList Memory representation of Linked List ,Operations on Linked List: Insertion,Deletion,DisplayandSearch,TypesofLinkedList:Singly, Doubly LinkedList& Circular LinkedList • **Tree**:DefinitionofTree,Treeterminology(root,child,parent,sibling, descendent, ancestor, leaf/external node, branch node/internal node, degree, edge, path, level, depth, heightofnode, heightoftree,forest), DifferencebetweenBinaryTree and BinarySearchTree	**15**

TextBook/Reference book:

1. DatastructurethroughC++-YashwantKanitkar(BPBPublications)
2. PrinciplesofDatastructuresusingc++-VinuV.Das(NewAgeInternationalPublication)
3. DataStructureswithC-SEYMOURLIPSCHUTZ(Tata McGraw-Hill)
4. Datastructures,AlgorithmsandApplicationsinC++,S.Sahni,UniversityPress(India)Pvt.Ltd,2nd edition, Universities Press Orient Longman Pvt. Ltd.

B.Sc.ComputerScience[Entire](Semester–IV)(NEP2.0)(Level–5.0) Course:
Subject I Major VIII
Course Title: RDBMS with PL-SQL
TotalContactHours:30 Hrs.(30Lecturesof60minutes)
Teaching Scheme: Theory-02Lectures/Week **Marks:**50 **Credits:** 02

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,students willable to:

1) Understand variousfunctionsandsubqueries.
2) Understandvariousjoinsandviews.
3) Usethecontrolstatementsandstoredprocedures.
4) Usethecursorsandtriggers.

UNIT	Contents	Hours Allotted
01	**MySQLFunctions,SubqueriesandJoin.** • **FunctionsinMySQL:**Aggregatefunctions(avg,count,min,max,sum), String Functions (con cat, instr, mid, length, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt), Date and Time Functions (adddate, datediff, day, month, year, hour, min, sec). • **Subqueries**–ConceptsofSubqueries,subquerieswithIN,EXISTS,NOT EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated sub queries, Group by and Having clause. • **ConceptsofJoin**,TypesofJoins- Inner Join,OuterJoin, Left Join,Right Join, Cross Join • **Views**(creating,alteringdropping,renamingandmanipulatingviews).	**15**
02	**AdvancedMySQL** • **ControlStatements**- If, caseandloop, • **BlockStructureandStoredprocedures**–Creatingandexecuting procedures with and without parameters, • **Cursors-**Declare, open,fetch,close, • **Triggers**-Create,showanddroptrigger,Typesoftriggers.	**15**

ReferenceBooks:

1. R.Ramakrishanan,J.Gehrke,DatabaseManagementSystems3rdEdition,McGraw- Hill, 2002.
2. A.Silberschatz,H.F.Korth,S.Sudarshan,DatabaseSystem Concepts6th Edition, McGraw Hill, 2010.
3. R.Elmasri,S.B.NavatheDatabaseSystemsModels,Languages,Design andapplication Programming, 6th Edition, PearsonEducation, 2013.

B.Sc.ComputerScience(Entire)(Part-II)(Semester-III)(NEP)
Major Practical- III

Computer Science PracticalbasedonMajor VII and VIII

Course– basedonLinearAlgebraandNumericalMethods

Credits:02 TeachingScheme:Practical–4Lectures/Week/batch TotalMarks:50

List ofPractical:

Followingisasamplelistofassignmentsforpractical,instructorsareadvisedtoprovidemorelab assignments to students to meet the course specified outcomes.

Data Structure With C++

- **PracticalBasedonCourse:SubjectIMajorVII:DataStructurethroughC++**

1	WriteaC++programtoimplementrecursivei)Linearsearchii) Binarysearch
2	WriteaC++programtoimplementsortingmethods(UsingArray) i)Bubblesortii)Selectionsortiii)Quicksortiv)Insertionsort
3	WriteaC++programtoimplementthefollowingusinganarray a)StackADT b)QueueADT
4	WriteaC++programtoimplementlistADTtoperformfollowingoperations
5	Insertanelementintoalist
6	Deleteanelementfromlist
7	Searchfor akeyelementinlist
8	countnumber ofnodesinlist
9	WriteC++programtoimplementthefollowingusingasinglylinkedlist a)StackADT b)QueueADT
10	WriteC++programforimplementingsorting methods(UsingLinkedList) i)Bubblesort ii)Selectionsortiii)Quicksort iv)Insertionsort

RDBMS with Pl-SQL

1	Apracticaltodemonstratedifferentdate&timefunctions.
2	Apracticaltodemonstratedifferentmathematicalfunctions.
3	Apracticaltodemonstratedifferentstringfunctions.
4	Apracticaltodemonstratedifferent otherfunctions.
5	Apracticaltodemonstratedifferentclauses.
6	Apracticaltodemonstratesimpleandnested query.
7	Apracticaltodemonstratedifferentjointypes.
8	Apracticalonhowtocreateviewanddropview.
9	Apracticalonhowtocreate storedprocedureandotheroperations.
10	Apracticaltodemonstratedifferentiterativestatements.
11	Apracticaltodemonstratedifferentcontrolflowstatements.
12	Apracticalonhowtocreateanddrop triggers.

B.Sc. Computer Science(Entire)(Part-II)(Semester-IV) (NEP)
Course III Miner VII
Course Title: Computer Networking
Total Contact Hours: 30 hrs. (30 lectures of 60min.)
Credits: 02 TeachingScheme:Theory–2Lectures/Week TotalMarks:40

CourseOutcomes(COs):Oncompletionofthecourse,thestudentswillbeableto:

1. Understand the concept of Networks & Network Models,
2. Understand different Networking Devices& Transmission media,
3. Understand the data linking, data flow control & error detection,
4. Understand Network Layer, Transport Layer, Application Layer,

Unit	Contents	Hours
1	**A) ComputerNetworks&NetworkModels:** ClassificationofNetworks,NetworkTopologies,NetworkModels:TCP/IPModel, 7 Layered ISO/OSI Model, Applications of each Layer of ISO/OSI Model, **B) PhysicalLayer:**TransmissionMedia:Guided&UnguidedMedia,Co-axialCable, Optical fiber, Ground-wave Propogation, Sky-wave Propogation, Microwave linking, Satellite linking, Networking devices: Hub, Switch, Router, Bridge, Gateway, DataModems,Multiplexingtechniques, **C) Data-LinkLayer:** Data-flow control- Framing, Data Error detection & Data Error correction,Stop-andWaitProtocol,SlidingWindowProtocols,	15
2	**A) NetworkLayer:**LogicalAddressing,IPv4addressing:addressspace,classes of addressing, IPv6 addressing, Comparison between IPv4 & IPv6 addressing,Internet Protocol(IP): IP Datagram format, Fragmentation,ICMP Protocol &Messages, **B) TransportLayer:**Services-Connection-less&Connection-OrientedService, UDP Protocol: User Datagram, UDP services & applications, TCPProtocol:TCPservices,TCPfeatures,TCPsegmentstructure,TCPconnection, SCTP Protocol: SCTP services, SCTP features, SCTP packet format, **C) ApplicationLayer:**World-Wide-Web(www),DomainNameSystem(DNS), HTTP Protocols, FTP Protocols, Email Protocols: SMTP protocol, POP protocol, IMAP protocol, SNMP protocol, DHCP Protocol, RemoteLoginProtocols:TELNETProtocol,SSHProtocol,	15

ReferenceBooks:

1. Computer Networkingby Andrew Tannenbaum,
2. Data&ComputercommunicationbyWilliamStallings,
3. Advanced Computer Networking by Nirali Publication,
4. Computer Networking &Data Communication by Nirali Publication,

B.Sc. Computer Science (Entire)(Part-II)(Semester-IV) (NEP)
Course III, Miner _VIII
Course Title: Micro-Controller &Interfacing,
Total Contact Hours: 30 hrs. (30 lectures of 60 min.)
Credits: 02 TeachingScheme:Theory–2Lectures/Week TotalMarks:40

Course Outcomes(COs):On completion of the course, the students will be able to
CO1:Understand the difference between Microprocessor & Micro-controller,
CO2: Learn & Understand the Instruction set of Micro-controller,
CO3:To study different features of Micro-controller,
CO4:To study interf cing of different peripheral device swith Micro-controller,

Units	Contents	Hours
1.	**A) IntroductiontoMicro-controller-8051:** Comparison between Micro-controller&Microprocessor,4-bit,8-bit,16-bit&32-bit Micro-controllers & their applications, Study of 8051 Micro-controller & itsfamily, Comparative study of 89c51, 8031, 8032,8052, 8751, 89c51RD2, 89c51VRD2, Architectureof8051:InternalBlockdiagramf8051,Reset&Clocksignal,Registers, Flags, Internal memory, SFR registers, I/O ports, **B) 8051InstructionSet:**InstructionSet,AddressingModes,TypesofInstructions: Arithmetic & Logical, Data transfer, Jump, loop, CALL, Bit Manipulation, Serial Communication instructions, machine control instructions, Assembly language programming, Embedded C programming,	**15**
2.	**A) Facilitiesin8051:** **Timers&Counters:**TimerModes,ProgrammingofTimers&Counters,Assembly language programming , Embedded C programming, Time-delay generation, **SerialPort:**ProgrammingofSerialPort,RS-232standards,ICMAX-232,Baud Rate, Programming for transmitting character through serial port in assembly & Embedded C, **B) InterfacingofPeripheraldeviceswith8051:** InterfacingofLED,Relay,Opto-coupler,Thumb-wheelswitch,7-segmentdisplay, Interfacing of Stepper motor, DC motor(PWM), LCD (16x2) with 8051, with Assembly language & Embedded C programming,	**15**

ReferenceBooks:

1. 8051Micro-controllers&InterfacingbyMohammadMazidi,
2. 8051Micro-controller byK.JAyala,
3. 8051 Micro-controller by Ajay Deshmukh,
4. Micro-controller&InterfacingbyA.P.Godse,Technical publication,
5. Micro-controolerArchitecture&Programming,byNiraliPublication,

B.Sc.ComputerScience(Entire)(Part-II)(Semester-IV)(NEP) Practical-I, (Electronics Practical based on Minor VII & VIII)	
Sr. No.	**Nameofthe Practical**
1	Interfacing of LED, Relay &Opto-coupler with Microcontroller-8051,
2	InterfacingofaThumb-wheelswitchor7-segmentdisplaywith 8051,
3	TimedelaygenerationusingTimers(inMode1orMode2)of 8051,
4	Interfacing of aStepper motor with 8051,
5	Interfacingof DCmotor (PWM) with 8051,
6	Arithmetic&Logicaloperationsbyusing8051,
7	InterfacingofDACwith8051togenerateSquarewave&Triangularwave,
8	Interfacingof LCDdisplay &Keyboard with micro-controller 8051,
9	InterfacingofADCtosampleasignal&convertintodigitalwith 8051,
10	Programming&transmissionofSerialdatathroughserialportof8051,
11	IntroductiontoNetworkingdevices,cables&connectors,Crimpingtool&LANtester,
12	PreparationofPatchcord&CrossconnectioncabletoconnectdevicesinaLAN,
13	ConfigurationofLAN:settingofIPaddressesmanually&DHCP addressing,
14	Prepare&configureaLANof3computersusingHUB/Switch,forsharingofResources,
15	StudyofdifferentNetworkingcommandsoncommandlineinterfaceinaLAN,
16	StudyofdifferentNetworkingsoftware:CiscoPacketTracer,NetworkSimulator (NS),
17	ConfigureInternetconnectivityofyourcomputerinaLANwithLANNetworkdrivers,
18	StudyofsharingofresourcesbyFTPprotocoltotransferafilefromonesystemtoanother,
19	InterconnecttwocomputersbyusingRS-232cable&transferdatabetween computers,
20	Install&configureaRouter/Repeater/BridgeofyourLANnetwork,

B.Sc. Computer Science(Entire)Part-II (Semester IV)

CourseIII Miner VIICourse Title: Computational Geometry

Total Contact Hours: 30 hrs. (30 lectures of 60 min)

Credits:02Teaching Scheme :Theory–02Lectures/WeekTotalMarks:50

1. **CourseOutcomes(COs):Oncompletionofthecourse,thestudentswillbeableto:**
2. Understand how to represent point, lines, transformations and matrices.
3. Understand how to Various types of transformations.
4. Solvemultipletransformationandprojectiononthreedimensional.
5. Understand the concepts curve, its properties and B-spline curve.

UNIT	CONTENTS	HOURS ALLOTTED
1	**Twodimensionaltransformations** 1.1 Introduction 1.2 Representationof Point 1.3 Basic2DTransformation:Scaling,Shearing,Rotation, Reflection 1.4 CombinedTransformation 1.5 Transformationofpoints,straightlines 1.6 MidpointTransformation 1.7 Slopeoftransformedline 1.8 Transformationofparallellinesandintersectinglines 1.9 HomogeneouscoordinatesandHomogeneousmatrix 1.10 Rotationabout anarbitrary point. 1.11 Reflectionthroughanarbitraryline. 1.12 Solid body transformation 1.13 Pointat infinity.	15
2	**Threedimensionaltransformations** 3.1 Introduction. 3.2 Threedimensional–Scaling,Shearing,Rotation,Reflection,Translation. 3.3 Multiple transformations. 3.4 Rotationabout–anaxisparalleltocoordinateaxes,anarbitraryaxisin space. 3.5 Reflectionthrough–planesparalleltocoordinate planes. 3.6 Reflectionthrougharbitraryplane(onlyalgorithm). 3.7 **PlaneCurves** 3.7.1 Introduction. 3.7.2 Curve representation 3.7.3 Parametricrepresentationofacircleandgenerationof circle. 3.7.4 Parametricrepresentationofanellipseandgenerationof ellipse. 3.7.5 Parametricrepresentationofaparabolaandgenerationofparabolic Segment	15

RecommendedBook:

1. Mathematicalelementsforcomputergraphics,F.DavidandJ.AlanAdams(McGrawHill International Edition)

REFERENCEBOOKS:

1. Computergraphics,Schaumseries.
2. ComputerGraphicshandbook,GeometryandMathematics,M.E.Mortenson,IndustrialPressInc.

B.Sc. Computer Science (Entire) Part-II (Semester IV)

Course III Miner VII

Course Title: Operational Research

Total Contact Hours: 48 hrs. (60 lectures of 48 min)

Credits:02 TeachingScheme:Theory–04Lect./Week Total Marks: 50

Course Outcomes(COs):On completion of the course, the students will be ableto:

1. learn about characteristics, scope of operation Research.
2. Understand the Assignment problem.
3. UnderstandtheTransportationproblemInitialSolutionandOptimization.
4. To know the fundamental of game theory.

UNIT	CONTENTS	HOURS ALLOTTED
1	**IntroductiontooperationResearchandTransportationproblem** 1.1 Basicsofoperationresearch 1.2 Differentdefinitionsofoperationresearch 1.3 Characteristics,scope,limitationsofoperation research 1.4 BasicsofTransportationproblem 1.5 BasicDefinitions 1.6 Initial Solution • North–Westcornermethodandexamples • Matrixminima methodand examples • Vogel'sapproximationmethodandexamples 1.7 MODImethodandexamples 1.8 Maximizationintransportationproblemand examples 1.9 Unbalancedtransportationproblemandexamples	15
2	**AssignmentproblemandTheoryofGames** 2.1 IntroductiontoAssignment problem 2.2 Hungarianmethodandexamples 2.3 MaximizationinAssignmentproblemsand examples 2.4 UnbalancedAssignment problemandexamples 2.5 Assignmentproblemswithrestrictionsandexamples 2.6 Basicsdefinitionsof**GameTheory** 2.7 Saddlepoint and examples 2.8 Algebraicmethodfor$\mathbf{2}\times\mathbf{2}$sizegame and examples 2.9 Arithmeticmethodfor$\mathbf{2}\times\mathbf{2}$sizegame and examples 2.10 Principalofdominance,Dominancemethodandexamples 2.11 Sub-gamemethod for$\mathbf{2}\times\boldsymbol{n}$ &$\boldsymbol{m}\times\mathbf{2}$sizegame and examples 2.12 Graphicalmethodfor$\mathbf{2}\times\boldsymbol{n}$&$\boldsymbol{m}\times\mathbf{2}$sizegameand examples	15

RecommendedBook:

1. OperationsResearch,S. D. Sharma

REFERENCEBOOKS:

1. PrinciplesofOperationsResearch,H.M.Wagner,PrenticeHallofIndia.

2. OperationsResearch,GuptaandHira.
3. OperationsResearch,JKSharma(secondedition)

B.Sc. Computer Science (Entire) Part-II (Semester IV)

Course Title: Mathematics Laboratory course

Based on Computational Geometry and Operational Research

Credits:02 TeachingScheme:Practical–4Lectures/Week/batchTotalMarks:50

List ofPractical:

Practical Number	Titleofthepractical
1	PlaneLinear transformation – I Scaling,Shearing,ReflectionCombinedtransformation matrix
2	PlaneLinear transformation – II Rotationaboutorigin,Rotationaboutarbitrarypoint,Reflectionthrougharbitraryline
3	Spacelineartransformation–I Scaling,ShearingandRotationaboutCoordinateaxis,ReflectionthroughCoordinate planes
4	Spacelineartransformation–II TranslationMultipletransformations,RotationaboutalineparalleltoCoordinateaxis, Rotation through planes which are parallel to Coordinate planes
5	PlaneCurves – I Generationofpointsoncircleandellipse(Examples only)
6	PlaneCurves_ II Generationofpointsonparabolicsegment(Examples only)
7	Initialsolutionoftransportationproblem – I North–WestCornermethod,Matrixminima method
8	Initialsolutionoftransportationproblem–II Vogel's approximation method
9	Maximizationoftransportationproblem,Unbalancedtransportationproblem
10	AssignmentProblem-Minimizationtypeand Maximization in assignment problem,
11	Graphicalmethodfor$\mathbf{2}\times\boldsymbol{n}\&\boldsymbol{m}\times\mathbf{2}$sizegame
12	ComputerProgram: 1) Tocheckgiventransformationissolidbodytransformation ornot. 2) TodeterminevalueofgameusingArithmeticMethod 3) TodeterminevalueofgameusingAlgebraicMethod

B.Sc. Computer Science [Entire](Semester–IV)(NEP2.0)(Level–5.0) Open Elective (OE) - IV

Course Title: Enterprise Resource Planning[ERP]

TeachingScheme:Theory:02Lect./Week **TotalMarks:**50 **Credits:**02

Course Outcome-

Aftercompletionofthiscoursestudentswillbeableto–

1. UnderstandtheconceptofERPanddifferent ERPtechnologies
2. UnderstandERPimplementationlifecycle.
3. DescribetheERPmodels.

UNIT	Contents	HoursAllotted
01	• IntroductiontoERP:DefiningERP,OriginandNeedforanERP System, Evolution of ERP, Benefits of an ERP System, • ReasonsfortheGrowthofERPMarket,ERPmodels,Subsystemsof ERP models. ERP related technologies-Business Intelligence (BI), • DataWarehousing,DataMining,On-LineAnalyticalProcessing (OLAP), Geographical Information System (GIS).	15
02	• ERPImplementation:PrerequisitesofERPimplementation,ERP implementation strategies, • PhasesinERPimplementation,ERPvendorselectioncriteria,Role of consultant in ERP implementation, • RoleofUsersinERPimplementation,RoleofTopmanagementin ERP implementation	15

ReferenceBooks:

1. EnterpriseResourcePlanning,AlexisLeaon,(SecondEdition),TataMcGrawHillEducation Private Limited, 2011
2. ERPDEMYSTIFIED,AlexisLeon,(SecondEdition),TataMcGrawHillEducationPrivate Limited, 2008
3. ERPPlak,CarolA.,EliSchragenheim(St.LuciePressNY)
4. ReengineeringCorporation–Mammer,Micheal,JamisChambey
5. BusinessProcessReengineering–JayaramanM.S.(TMG)
6. BestPracticesinReengineering–CarrD.K.JohnansonH.J.(MGH)
7. BusinessProcessReengineering:Myth&Reality–CoulsonThomasC.

B.Sc. Computer Science[Entire](Semester–IV)(NEP2.0)(Level–5.0)

Skill Enhancement Course (SEC) - II

CourseTitle: JavaScript

TeachingScheme: Practical:02Lectures/Week **TotalMarks:**50 **Credits:**02

CourseOutcomes: Aftercompletionofthiscoursestudentsshouldbeable to:

1. UnderstandbasicsofJava Script
2. Designawebpagetointeractwithuser.
3. Handledifferenteventslikemouse,key,focus for use rinteraction.
4. DesignwebformusingJQuery

UNIT	Contents	HoursAllotted
1	**IntroductionToJavaScript** • Introductionto JavaScript, Datatypes, operators and expressions, variables, Arrays, <script> tag and attribute. • Controlstructures:if-else,switchcase, whileloop,forloop,for-in Loop control-break, continue &label. **InteractingWithUser:** • UserdefinedFunction,Stringfunction,creatingalert,prompt& confirmdialogbox,Gettingconfirmationsfromusers,Handling errors, form validation	**15**
2	**HandlingEvents** • Respondingtomouse-onclick,ondblclick,onmousedown, onmouseenter, onmousemover, onmouseout • Focusevents:onblur,onfocus • Keboard:onkeydown,onkeypress,onkeyup **UsingJQuery** • JavaScriptlibraries,use of jQuery libraryinpage,selecting elements on apage with jQuery, bindeventsusingjQuery. • ModifyingstylesonthePage. • ModifyingContentonthePage.	**15**

ReferenceBook:

1) Mastering HTML,CSS&JavaScript–BPBPublication.

2) WebTechnology–RameshBangia

3) Javascriptforbeginners,-Mahesh Bhave&Sunil Petkar,ShroffPublisher&DistrubuterPVT,LTD.

B. Sc. Computer Science (Entire) Part- II (Semester IV)
Course Code: SEC-II: Skill Enhancement Course
Course Title: Statistics for Computer Science II
Credits: 02, Total Marks: 50
Teaching Scheme: Theory: 02 Lect. / Week

Course Outcomes:

After completion of this course students should be able to

1. Understand concept of continuous univariate random variable and probability distribution.
2. Understand standard continuous probability distributions like Uniform, Exponential and Normal distribution.
3. Analyse data effectively using above continuous probability distributions.
4. Get insight to apply standard continuous probability distributions to different situations.

Unit	Contents	Hours Allotted
1.	**1.1Continuous random experiment and variable** Introduction to random experiment with special reference to infinite outcomes, Definition: infinite sample space, continuous random variable (r.v.)and its real-life examples. **1.2 Probability density function (p.d.f.)** Probability distribution of continuousr.v. (p.d.f.), cumulative distribution function of r.v. (c.d.f.), expectation (mean), median, modeand variance of continuous random variable, properties of c.d.f., graph of p.d.f. and c.d.f. Illustrative examples.	**15**
2.	**2.1Standard Continuous Probability Distributions**: Real life situations of continuous r.v. with reference to computer science, Continuous Uniform distribution: Definition of p.d.f., real life examples, c.d.f., mean and variance. Exponential distribution: Definition of p.d.f., real life	**15**

	examples, c.d.f., mean and variance, memory less property and its applications in computer science field,Illustrative examples. **2.2Normal Distribution:**Definition of p.d.f., real life examples, Standard Normal distribution, Normal curve, properties of Normal distribution, mean and variance, 6-sigma limits, Importance of 6-sigma limits in IT industry, Limiting form of Binomial to Normal and Poisson to Normal distribution (only statements), Additive property of Normal distribution,Illustrative examples.	

References and Recommended Readings:

1. Trivedi R.S.: Probability and Statistics with Reliability and Computer Science Application, Prentice–Hall of India Pvt. Ltd., New Delhi.
2. Parimal Mukhopadhyay: An Introduction to the Theory of Probability. World Scientific Publishing.
3. Hogg R.V. and Criag A.T.: Introduction to Mathematical Statistics (Third edition), Mac-Millan Publishing, New York.
4. Goon A.M., Gupta M.K. and Dasgupta B.: Fundamentals of Statistics Vol. I and Vol. II World Press, Calcutta.
5. Gupta S.C.& Kapoor V.K.: Fundamentals of Mathematical Statistics. Sultan Chand & sons, New Delhi.
6. Gupta S. C. & Kapoor V.K.: Applied Statistics. Sultan Chand & sons, New Delhi.
7. Mood A.M., Graybill F.A. and Boes D.C.: Introduction to theory of Statistics. Tata, Mc-Graw Hill, New Delhi.(Third Edition)
8. Walpole R.E. & Mayer R.H.: Probability & Statistics. Mac-Millan Publishing Co. Inc, New York.

B.Sc. Computer Science (Entire)(Semester – IV) (NEP 2.0)
(Level – 5.0)
Course: AEC-II
Course Title: Soft Skills
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Marks: 50 Credits: 02

Course Outcomes:
The course will enable students to;

1. To empower the students towards general and technical writing, oral communications
2. To empower listening skills: letter writing, technical report writing, and business communication.

UNIT I **(15 Hours)**

Expression: Practical communication skill development, business presentation with multimedia, speaking skill, prepared speech, extempore speech.

UNIT II **(15 Hours)**

Writing: Technical/business letter, Resume Preparation, organization of writing material, poster presentation, writing technical document, preparing software user manual, preparing project documentation.

Reference Books:

1. Business Correspondence & Report Writing, Sharma, TMH
2. Business Communication Strategies, Monipally, TMH
3. English for Technical communication, Laxminarayanan,Scitech
4. Business Communication, Kaul,PHI
5. Communication Skill for Effective Mgmt., Ghanekar,EPH

B.Sc. Computer Science (Entire)(Semester – IV) (NEP 2.0) (Level – 5.0) Course: VEC-II

Course Title: Environment Studies

Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)

Marks: 50 Credits: 02

Course Outcomes:

The course will enable students to;

1. To understand basic concepts of environment.
2. To understand concept of biodiversity and its conservation measures.

UNIT I **(15 Hours)**

Definition, principles and scope of Environmental Science, Components of Environment Introduction, Atmosphere, Hydrosphere, Lithosphere and Biosphere, Natural Resources: Concept, types of resources; Renewable and Non-renewable resources, water resource, forest resources, mineral resources, energy resources, food resources, land resources, coal, petroleum, natural gas, nuclear energy, Ecosystem: Concept, Components of ecosystem, Types of Ecosystems, Productivity and energy flow, Food chain and Food webs, Ecological Pyramids,Lake Environment, Material cycle in ecosystem- Carbon cycle, oxygen cycle, nitrogen cycle,phosphorus cycle, sulphur cycle, mineral cycle, Basic concepts of population ecology, population dynamics, characteristics of population: natality, mortality, fecundity, density, age distribution, relationships among organisms, population explosion, Community types and community composition.

UNIT II **(15 Hours)**

Levels of biological diversity: genetic, species and ecosystem diversity, Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, Sanctuaries, National Parks, Biosphere reserves.

Reference:

1. Environmental science by S. C. Santra, New Central Book Agency (P) Ltd.
2. Environmental Studies by Dr. P. D. Raut Department of Environmental Science, Shivaji University, Kolhapur

B.Sc. Computer Science (Entire)(Semester – IV) (NEP 2.0) (Level – 5.0)
Course: CEP-I

Title of course: CEP-I: Field work

- **Field work as per NEP 2.0 (CEP, CC), University circular enclosed**

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दूरध्वनी - इपीबीएक्स - २०६०९०००, अभ्यासमंडळे विभाग : ०२३१- २६०९०९४, २६०९४८७
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Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

संदर्भ क्र. : शिवाजी वि./अ.म./400 दिनांक : 15/07/2024

प्रति,

1. मा. प्राचार्य/संचालक,
सर्व संलग्नित महाविद्यालये/मान्यताप्राप्त संस्था,
शिवाजी विद्यापीठ, कोल्हापूर

2. मा. अधिविभाग प्रमुख,
सर्व अधिविभाग,
शिवाजी विद्यापीठ, कोल्हापूर

विषय : राष्ट्रीय शैक्षणिक धोरण, 2020 (NEP 2.0) नुसार CEP, CC अभ्यासक्रमाबाबत.

महोदय/महोदया,

उपरोक्त संदर्भिय विषयास अनुसरुन आपणास आदेशान्वये कळविण्यात येते की, राष्ट्रीय शैक्षणिक धोरण २०२० (NEP 2.0) नुसार शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्यात आलेल्या सर्व पदवी कोर्सला लागू असणा–या **Community Engagement Programme (CEP), Co-Curricular Courses (CC)** अभ्यासक्रम/त्याची नियमावली सोबत पाठवित आहे.

सदर **Community Engagement Programme (CEP), Co-Curricular Courses (CC)** अभ्यासक्रमाच्या प्रती जोडल्या आहेत. तसेच विद्यापीठाच्या www.unishivaji.ac.in,NEP-2020@suk (Online Syllabus) या संकेतस्थळावर ठेवण्यात आल्या आहेत.

सदर अभ्यासक्रम/त्याची नियमावलीची सर्व संबंधित विद्यार्थी व शिक्षकांच्या निदर्शनास आणून द्यावेत ही विनंती.

कळावे,

आपला विश्वासू,

(डॉ. एस. एम. कुबल)
उपकुलसचिव

सोबत : अभ्यासक्रमाची प्रत.

प्रत : माहितीसाठी व पुढील योग्यत्या कार्यवाहीसाठी.

अधिष्ठाता, सर्व विद्याशाखा	पात्रता विभागास
अध्यक्ष, सर्व अभ्यास व अस्थायी मंडळे	पी.जी. सेमिनार विभागास
संचालक, परीक्षा व मुल्यमापन मंडळ कार्यालयास	पी.जी. प्रवेश विभागास
परिक्षक नियुक्ती ए व बी विभागास	संलग्नता टी. १ व टी २ विभागास
दूरस्थ व ऑनलाईन शिक्षण विभागास	नॅक विभागास
संगणक केंद्र/आय. टी. सेल विभागास	सर्व ऑन परीक्षा विभागास

SHIVAJI UNIVERSITY, KOLHAPUR

Established: 1962

A^{++} Accredited by NAAC (2021) With CGPA 3.52

New Syllabus For

Community Engagement Programme (CEP)

All Bachelor Degree Programme

STRUCTURE AND SYLLABUS IN ACCORDANCE WITH

NATIONAL EDUCATION POLICY - 2020

HAVING CHOICE BASED CREDIT SYSTEM

WITH MULTIPLE ENTRY AND MULTIPLE EXIT OPTIONS

(TO BE IMPLEMENTED FROM ACADEMIC YEAR 2024-25 ONWARDS)

Community Engagement Programme (CEP):

1. INTRODUCTION:

New generation of students are increasingly unaware of local rural and peri-urban realities surrounding their HEIs, as rapid urbanization has been occurring in India. A large percentage of Indian population continues to live and work in rural and peri-urban areas of the country. While various schemes and programs of community service have been undertaken by HEIs, there is no singular provision of a well- designed community engagement course that provides opportunities for immersion in rural realities. Such a course will enable students to learn about challenges faced by vulnerable households and develop an understanding of local wisdom and lifestyle in a respectful manner

2. OBJECTIVES:

- To promote a respect for rural culture, lifestyle, and wisdom among students.
- To learn about the present status of agricultural and development initiatives.
- Identify and address the root causes of distress and poverty among vulnerable households.
- Improve learning outcomes by applying classroom knowledge to real-world situations.

To achieve the objectives of the socio-economic development of New India, HEIs can play an important role through active community engagement. This approach will also contribute to improve the quality of both teaching and research in HEIs in India. India is a signatory to the global commitment for achieving Sustainable Development Goals (SDGs) by 2030. Achieving these 17 SDG goals requires generating locally appropriate solutions. Community engagement should not be limited to a few social science disciplines alone. It should be practiced across all disciplines and faculties of HEIs. These can take the forms of enumerations, surveys, awareness camps and campaigns, training, learning manuals/films, maps, study reports, public hearings, policy briefs, cleanliness and hygiene teachings, legal aid clinics, etc. For example, students of chemistry can conduct water and soil testing in local areas and share the results with the local community. Students of science and engineering can undertake research in partnership with the community on solid and liquid waste disposal Therefore, students are being encouraged to foster social responsibility and community engagement in their teaching and research.

3. LEARNING OUTCOMES:

After completing this course, students will be able to

- Gain an understanding of rural life, Indian culture, and social realities.
- Develop empathy and bonds of mutuality with the local community.
- Appreciate the significant contributions of local communities to Indian society and economy.
- Learn to Value local knowledge and wisdom.
- Identify opportunities to contribute to the community's socioeconomic improvement.

4. **Credits:** Two credit Course; Students are expected to complete 60 hours of participation

5. COURSE STRUCTURE:

Sr.	Module Title	Module Content	Teaching/Learning/Methodology
1	Appreciation of Rural Society	Rural lifestyle, rural society, joint family, caste and gender relations, rural values with respect to community, rural culture nature and public resources, ponds and fisheries, elaboration of soul of India lies in villages' rural infrastructure,	Classroom discussionsField visit Individual /Group conference Report/journal submission & VIVA
2	Understanding rural and local economy and livelihood	Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihood and artisan's rural entrepreneurs, rural markets, migrant labour, social innovation projects	Classroom discussionsField visit Individual /Group conference Report/journal submission & VIVA
3	Rural and local Institution	Traditional rural and community organization, self-help groups, decentralized planning, panchayat raj institutions Gram panchayat, Nagarpalika and Municipalities, local Civil Society, Local administration, National rural, Livelihood Mission [NRLM], Mahatma Gandhi National Rural Employment. Guarantee [MGNREGA].	Classroom discussionsField visit Individual /Group conference Report/journal submission & VIVA
4	Rural and National development programmers	History of rural development and current National Programms in India: Sarva shiksha Abhiyan, Beti Bachao-Beti Padhao, Ayushman Bharat, eShram Swachh Bharat, PM Awas yojana, Skill India, Digital India, Start-Up India, Stand-Up India, Scheme of Fund for Regeneration of Traditional Industries (SFURTI), Jal Jeevan Mission, Mission Antyodaya, ATMANIRBHAR Bharat, etc..	Classroom discussionsField visit Individual /Group conference Report/journal submission & VIVA

Note: Faculty can make addition in the list of activities as per domain content:

Recommended field-based activities (Tentative):

- Participate in Gram Sabha meetings, and study community participation;
- Visit to Swachh Bharat Mission project sites, conduct analysis and initiate problem solvingmeasures;
- Interaction with Self Help Groups (SHGs) women members, and study their functions and challenges; planning for their skill-building and livelihood activities;
- Visit Mahatma Gandhi National. Rural Employment Guarantee Act 2005 (MGNREGS) project sites, interact with beneficiaries and interview functionaries at the work site;
- surveys on Mission Antyodaya to support under Gram Panchayat Development Plan
- Visit Rural Schools/mid-day meal centres, study academic and infrastructural resources, digital divide and gaps;
- Associate with Social audit exercises at the Gram Panchayat level, and interact with programme beneficiaries;
- Visit to local Nagarpalika office and review schemes for urban informal workers and migrants;
- Attend Parent Teacher Association meetings, and interview school drop outs;
- Visit local Anganwadi and observe the services being provided;
- Visit local NGOs, civil society organisations and interact with their staff and beneficiaries;
- Organize awareness programmes, health camps, Disability camps and cleanliness camps;
- Conduct soil health test, drinking water analysis, energy use and fuel efficiency surveys and building solar powered village;
- Understanding of people's impacts of climate change, building up community's disaster preparedness;
    - Organise orientation programmes for farmers regarding organic cultivation, rational use of irrigation and fertilizers, promotion of traditional species of crops and plants and awareness against stubble burning;
    - Formation of committees for common property resource management, village pond maintenance and fishing;
    - Identifying the small business ideas (handloom, handicaraft, khadi, food products, etc.) for rural areas to make the people self-reliant.
    - Interactive with local leaders, panchayat functionaries, grass-root officials and local institutions regarding village development plan preparation and resource mobilization;

- Financial Literacy Awareness Programme
- Digital Literacy Awareness Programme
- Education Loan Awareness Programme
- Entrepreneurship Awareness Programme
- Awareness Programmes on Government Schemes
- Products Market Awareness
- Services Market Awareness
- Consumer Awareness Programme
- Accounting Awareness Programme for Farmers
- Accounting Awareness Programme for Street Vendors etc.

6. IMPORTANT RULES AND REGULATIONS FOR CEP:

Concurrent Fieldwork:

Students must conduct comprehensive studies on various challenges that they face in their chosen field. Every work relevant to the subject matter should be compiled and documented.

Students should keep separate fieldwork diary or maintain journal in order to record their fieldwork experiences i.e. reading, e- contents, tasks, planning and work hours have to be recorded in the diary. Detailed work records report on students' fieldwork experiences and activities to be submitted and should be presented. The fieldwork conference is part of the timetable and is mandatory. Faculty should hold a fieldwork conference FOREIGHTNIGHTLY for all students.

In addition to the principal curriculum, the students engage in a variety of community development- related activities. They are encouraged to plan and carry out programs, processions, and events for social causes. These activities seek to enhance students' personal and professional skills as well as foster self- development. "Rural Camp" should be embedded in the curriculum for first-year students to be held in the backward and neglected areas of District's

Concurrent Fieldwork is the core curriculum activity in the CEP course. Hence, 100% attendance of the students is mandatory in case of absence on any student, supplementary fieldwork must be arranged and accomplished with the approval of the faculty supervisor.

7. EVALUATION/ASSESSMENT SCHEME:

Students should keep a Field Diary / journal to record, content, readings and field visit planning. The assessment pattern is internal and external i.e. 40+10.

Internal continuous Assessment: Participation in concurrent field visits 40%; individual/group field project conference, report/journal submission 40%.

External Assessment: Presentation of field project findings (VIVA) should be assigned 20%.