SHIVAJI UNIVERSITY, KOLHAPUR
416 004, MAHARASHTRA
PHONE : EPABX – 2609000, BOS Section – 0231-2609094, 2609487
Web : www.unishivaji.ac.in Email: bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर
४१६ ००४, महाराष्ट्र
दूरध्वनी - इपीबीएक्स - २०६०९०००, अध्यासमंडळे विभाग : ०२३१- २६०९०९४, २६०९४८७
वेबसाईट : www.unishivaji.ac.in ईमेल : bos@unishivaji.ac.in

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

SU/BOS/Sci & Tech/ 458 **Date: 12/08/2024**

To,

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

Subject: Regarding Minor Change syllabus of B.Sc. Part –I (Sem. I & II) as per NEP – 2020 (2.0) degree programme under the Faculty of Science and Technology.

Ref : 1. SU/BOS/Science/877 date : 26/12/2023
2. SU/BOS/Science/349 date : 24/06/2024

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 Minor Change syllabi, Nature of Question paper and equivalence of B.Sc. Part-I (SemI&II) as per NEP 2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc. Part-I (SemI&II) as per NEP 2020 (2.0)			
1.	Animation Science (Entire)	2	Computer Science (Entire)
3	Information Technology (Entire)		

This Syllabus, nature of question and equivalence shall be implemented from the academic year **2024-25** onwards. A soft copy containing the syllabus is attached herewith and it is available on university website **www.unishivaji.ac.in. (Student 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 2024 & March / April 2025. 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,

(Dr. S. M. Kubal)
Dy. Registrar

Copy to:

1	The I/c Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	The Chairpersan, Respective Board of Studies	7	Affiliation Section (T.1) (T.2)
3	B.Sc. Exam	8	P.G.Admission Section
4	Eligibility Section	9	P.G Seminar Section
5	Computer Centre / IT Cell	10	IQAC

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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

SU/BOS/Science/349 **Date: 24/06/2024**

To,

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

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

Ref: SU/BOS/Science/877/ Date: 26/12/2023 Letter.

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 Minor Change syllabi, nature of question paper B.Sc. Part-I (Sem. I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc.Part-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	Food Science and Technology (Entire)	6.	Biochemistry
2.	Food Science	7.	Biotechnology (Optional/Vocational)
3.	Food Science and Quality Control	8.	Biotechnology (Entire)
4.	Food Technology & Management (Entire)	9.	Pollution
5.	Computer Science (Opt)	10.	Environmental Science (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 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 2024 & March/April 2025. 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,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	4	B.Sc. Exam/ Appointment Section
2	Director, Board of Examinations and Evaluation	5	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	6	Affiliation Section (U.G.) (P.G.)

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दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Estd. 1962
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SU/BOS/Science/877 **Date: 26/12/2023**

To,

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

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 revised syllabi, nature of question paper and equivalence of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc.-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	Computer Science (Opt)	7.	Food Science and Quality Control (Entire)
2.	Computer Science (Entire)	8.	Food Technology & Management (Entire)
3.	Animation (Entire)	9.	Biochemistry (Optional/Vocational)
4.	Information Technology (Entire)	10.	Biotechnology (Entire)
5.	Food Science and Technology (Entire)	11.	Biotechnology (Optional/Vocational)
6.	Food Science (Entire)	12.	Environmental Science (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website **www.unishivaji.ac.in**)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. 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,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

SHIVAJI UNIVERSITY, KOLHAPUR

Accredited By NAAC "A++" Grade

Programme with Multiple Entry and Multiple Exit Option

As Per NEP-2020 (NEP 2.0)

Syllabus for

B. Sc. Animation Science (Entire) - I

(Under Faculty of Science and Technology)

SEMESTER- I AND II

(Syllabus to be implemented from Academic Year 2024-25)

Shivaji University, Kolhapur

B.Sc. Animation Science (Entire)

(Under Faculty of Science and Technology)

Preamble:

Animation is a lead Course in today's world. It has very good Prospects and it gives a broad platform to student creativity. The Course has wild scope. By considering the need of different Industries and present scenario in animation industry the syllabus is designed. While designing the syllabus intellectual level of UG Students have been consider. The students who don't know about the Animation will be able to understood and work independently in the Industrial world after completion of his graduate degree.

Animation is not only creation of cartoons but also its plays important role in Automobile industry, Mechanical industry, Web development, different coding, Vfx, Graphics designing, Film industry and etc. Bachelor of Animation course is one among the most demanded courses in today's world, In the very recent trend India is emerging inthe field of "Animation" and this would create a very huge employment in India, there are many big giant companies who are outsourcing their animation work in India like Disney. Animation as a Profession can be the best decision for those who are computer lovers, who can think different, innovative and keep capacity of presenting what they think. While designing the syllabus, industrial training and latest software's like Adobe Photoshop, Corel draw, Adobe Flash, Dream viewer, Autodesk 3D Max, Autodesk 3D Maya, Adobe after Effect, Mud box are considered.

This syllabus is based on basic and applied approach with vigor and depth. At the SASE time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

General Objectives of the Programme:

1) To nurture academicians with focus and commitment with their subject.
2) To shape good and informed citizens from the students entering into the programme.
3) To create skilled workforce to match their requirement of the society.
4) To impart knowledge of the science is the basic objective of this programme.
5) To develop scientific attitude is the major objective so as to make the students openminded, critical and curious.
6) To develop skill in practical work, experiment and laboratory materials and equipment's alongwith the collection and interpretation of scientific data to contribute to science.

General Program Outcomes:

1) The student will graduate with proficiency in the subject of their choice.
2) The student will be eligible to continue higher studies in their subject.
3) The student will be eligible to pursue higher studies abroad.
4) The student will be eligible to appear for the examinations for jobs in governmentorganizations.
5) The student will be eligible to apply for jobs with a minimum requirement of B.Sc.Program.

Specific Program Objectives.

- ✓ Computer Animation and Game Development graduates will have an understanding of critical and aesthetic issues in computer graphics and mixed-media.
- ✓ They will know basic aesthetic principles and concepts, and the production process.
- ✓ They will be able to effectively use technical, conceptual and critical abilities, and appropriate technology tools.
- ✓ They will be effective written and oral communicators with the ability to function as effective members of collaborative multi-disciplinary teams in the production process.
- ✓ They will be able to critically evaluate computer graphics and the mixed media. They will have an appreciation for the professional code of ethics for the creative process.

Specific Program outcomes of the course-

After successful completion of B.Sc. Animation science Course student will be able to:

- Learn, design and perform experiments in the labs to demonstrate the concepts, Principles and theories learned in the classrooms.
- Develop the ability to apply the knowledge acquired in the classroom and laboratoriesto specific problems in theoretical and experimental Animation science
- Identify their area of interest in academic, research and development.
- Perform job in various fields" like film industries, science, engineering, education, banking, business and public service, etc. Or be an entrepreneur with precision, analyticalmind, innovative thinking, clarity of thought, expression, and systematic approach.

1. **Medium of Instruction:**

   The medium of instruction will be English only

2. **Admission Procedure**

   To be eligible for admission to the B. Sc. Animation Science [Entire] a candidate must have passed

   - HSC (10+2) from science stream

     OR

   - Three Year Diploma Course (after SSC i.e. 10^{th} Standard), of Board of Technical Educationconducted by Government of Maharashtra or its equivalent

3. **Course Structure:**

   Lectures and Practical should be conducted as per the scheme of lectures and practical's indicated inthe course structure.

4. **Teaching and Practical Scheme**

   a) Contact session for teaching 60 minutes each.

   b) One Practical Batch should be of 20 students.

   c) Practical evaluation should be conducted after the commencement of university examination.

5. **Assessment**

1. The final practical examination will be conducted by the university appointed examiners internal as well as external at the end of semester for each lab course and marks will be submitted to the universityby the panel.
2. The practical examination will be conducted semester wise in order to maintain the relevance of the respective theory course with laboratory course.
3. The final examinations shall be conducted at the end of the semester.
4. Nature of question paper: Nature of question paper is as follows for University end semester examination.

❖ **Theory Examination**:

Que. No.	Question	Marks
Q.1.	08 Multiple Choice Questions (*One Mark each*)	**08 Marks**
Q.2.	Attempt any TWO out of THREE (*08 marks each*)	**16 Marks**
	a)	
	b)	
	c)	
Q.3.	Attempt any FOUR out of SIX (*4 marks each*)	**16 Marks**
	a)	
	b)	
	c)	
	d)	
	e)	
	f)	
	Total Marks	**40 Marks**

- **Internal Evaluation examination of 10 marks should be in the form of assignments**.

5. Practical Examination:

1. Practical Examination will be conducted at the end of Semester.
2. Each question paper carries 50 Marks.
3. Duration of Practical Examination: 3 Hrs.
4. Nature of Question paper: There will be four questions of 20 marks each. Students will be attempted any two out of four questions. The distribution of practical's papers:

Each question carries	: 20 marks (20 x 02 = 40 Marks) Certified
Journal carries	: 5 Marks and
Viva voce carries	: 5 Marks
Total Marks	**: 50 Marks**

6. Standard of Passing:

1. Minimum 16 marks in each subject. There shall be separate passing for theory (semester end exam and Internal) and practical also.
2. Admission to B.Sc. Animation Science (Entire) Part II is allowed even if the student fails in all thesubjects of part I
3. Admission to B.Sc. Animation Science (Entire) Part III is allowed only if student is passed on all the subjects of B.Sc. Animation Science (Entire) Part I

7. Board of Paper Setters /Examiners:

For each Semester end examination there will be a board of Paper setters and examiners for every course. While appointing paper setter /examiners, care should be taken to see that there is at least one person specialized in each unit of the course.

8. Credit system implementation:

As per the University norms

9. Clarification of Syllabus:

The syllabus committee should meet at least once in a year to study and clarify any difficulties from the Institutes.

10. Revision of Syllabus:

As the Animation technology experience rapid rate of obsolescence of knowledge, revision of the syllabus should be considered every two/three years.

11. Fees Structure: As approved by the Shivaji University fee fixation committee.

12. Intake Capacity: 60

13. Award of Class:

Grading: Shivaji University has introduced a Seven-point grading system as follows:

B.Sc. Animation Science (Entire) Part I Semester I & II

Multiple Entry and Multiple Exit Option

(NEP-2020) 2.0

Syllabus to be implemented from Academic Year 2024-25

Sr. No.	Marks Obtained out of 100	Marks Obtained out of 50	Grade Point	CGPA	Letter grade
1.	91 – 100	46 – 50	10	9.0 to 10.0	O: Outstanding
2.	81 – 90	41 – 45	9	8.0 to 8.99	A+
3.	71 – 80	36 – 40	8	7.0 to 7.99	A
4.	61 – 70	31 – 35	7	6.0 to 6.99	B+
5.	51 – 60	26 - 30	6	5.0 to 5.99	B
6.	40 – 50	20 – 25	5	4.0 to 4.99	C:
7.	< 40	< 20	0 to 4	0.0 to 3.99	Fail
8.	Absent	Absent	0	-	-

Title: **B.Sc. Animation Science (Entire) Part I**

1. Year of implementation: Syllabus will be implemented from June 2024 onwards
2. Duration: B.Sc. Animation Science (Entire) Part I. The duration of course shall be one year (Twosemesters).
3. Pattern: Pattern of examination will be semester
4. Medium of Instruction: English
5. Structure Of Course:

Multiple Entry and Multiple Exit Option (NEP-2020)

B.Sc. Animation Science (Entire) Program Structure

B.Sc. Animation Science (Entire) Part-I(Level-4.5)

Semester	Subject Type	Course Code	Course Title
SEM –I	Course I	Subject I DSC I	Fundamentals of Animation
		Subject I DSC II	Drawing and Sketching
		Subject I Practical I	Drawing and Sketching Lab
	Course II	Subject II DSC I	Foundation of Mathematics
		Subject II DSC II	Basic Algebra
		Subject II Practical I	Practical-I Based on Subject II DSC I and Subject II DSC II
	Course III	Subject III DSC I	Fundamental Electronics
		Subject III DSC II	Basic Digital Electronics
		Subject III Practical I	Practical Based on Subject III DSC-I and Subject III DSC-II
	OE-I		Basics of Management
	IKS-I		Vedic Mathematics
SEM –II	Course I	Subject I DSC III	Color Theory
		Subject I DSC IV	Multimedia and Animation graphics
		Subject I Practical II	Color Theory Lab
	Course II	Subject II DSC III	Numerical Methods
		Subject II DSC IV	Graph Theory
		Subject II Practical II	Practical-II Based on Subject II DSC III and Subject II DSC IV
	Course III	Subject III DSC III	Sensors and Signal Conditioning
		Subject III DSC IV	Advanced Digital Electronics
		Subject III Practical II	Practical Based on Subject III DSC-III and Subject III DSC-IV
	OE-II		Improving reading comprehension
	VEC-I		Democracy, Election and Constitution

SEMESTER-I (Duration- Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures (Per week)	Practical hours (Per week)	Credit	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours
1	Subject I DSC I: Fundamentals Of Animation	2	-	2	40	16	-	10	04	-
2	Subject I DSC II: Drawing and Sketching	2	-	2	40	16	-	10	04	-
3	Subject I Practical I: Drawing and Sketching Lab	-	4	2	40	16	-	10	04	-
4	Subject II DSC I: Foundation of Mathematics	2	-	2	40	16	-	10	04	-
5	Subject II DSC II Basic Algebra	2	-	2	40	16	-	10	04	-
6	Subject II Practical I: Based on Subject II DSC I and Subject II DSC II	-	4	2	40	16	-	10	04	-
7	Subject III DSC I: Fundamental Electronics	2	-	2	40	16	-	10	04	-
8	Subject III DSC II: Basic Digital Electronics	2	-	2	40	16	-	10	04	-
9	Subject III Practical I: Practical Based on Subject III DSC-I and Subject III DSC-II	-	4	2	40	16	-	10	04	-
10	OE I: Basics of Management	2	-	2	40	16	-	10	04	-
11	IKS I: Vedic Mathematics	2	-	2	40	16	-	10	04	-
	Total (A)	-	-	**22**	**440**	-	-	**110**	**440+110=550**	

SEMESTER-II (Duration- Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures (Per week)	Practical hours (Per week)	Credit	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours
1	Subject I DSC III: Color Theory	2	-	2	40	16	-	10	04	-
2	Subject I DSC IV: Multimedia and Animation graphics	2	-	2	40	16	-	10	04	-
3	Subject I Practical II: Color Theory Lab	-	4	2	40	16	-	10	04	-
4	Subject II DSC III: Numerical Methods	2	-	2	40	16	-	10	04	-
5	Subject II DSC IV: Graph Theory	2	-	2	40	16	-	10	04	-
6	Subject II Practical II: Practical-II Based on Subject II DSC III and Subject II DSC IV	-	4	2	40	16	-	10	04	-
7	Subject III DSC III: Sensors and Signal Conditioning	2	-	2	40	16	-	10	04	-
8	Subject III DSC IV: Advanced Digital Electronics	2	-	2	40	16	-	10	04	-
9	Subject III Practical II: Practical Based on Subject III DSC-III and Subject III DSC-IV	-	4	2	40	16	-	10	04	-
10	OE II: Improving reading comprehension	2	-	2	40	16	-	10	04	-
11	VEC I: **Democracy, Election and Constitution**	2	-	2	40	16	-	10	04	-
	Total (B)	-	-	22	440	-	-	110	-	-
	Total (A+B)	-		**44**	**880**	-		**220**	**880+220 = 1100**	

• Student contact hours per week: **30** Hours (Min.)	• Total Marks for B.Sc. Animation Science (Entire)-I: **1100**
• Theory and Practical Lectures: **60** MinutesEach	• Total Credits for B.Sc. Animation Science (Entire)-I (Semester I & II): **44**
• **Requirement for Entry at Level 4.5: Completed all requirements of the 10+2**	
• **Exit Option at Level 4.5:** Students can exit after Level 4.5 with under **Certificate Course in Animation Programming** if he/she completes the courses equivalent to minimum of **44** credits and an **additional 4 credits** core NSQF course / Internship.	

B.Sc. Part I: Semester -I Animation Science (Entire)

SUBJECT I DSC1 Fundamentals of Animation (Credits-02)

Course Objectives: Students Should:

1. Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
2. Provide hands-on use of Microsoft Office 2013 applications Word, Excel, Access and PowerPoint.
3. Provide foundational or "computer literacy" curriculum that prepares students for life-long learning of computer concepts and skills.
4. Understanding of why computers are essential components in business, education and society.

Unit-I

Introduction to Computer –

Evaluation of computer and its generations,

Classification of Computer

Computer Software's (System and Application)

Introduction to Microsoft Office.(Word, Excel, Power point, Access, PDF).

Input and output devices, Secondary storage devices

Memory and its types

Number System-

Number system and its conversions

Boolean Algebra and its laws

Computer Codes and combinational circuits

UNIT- II

Computer Languages-

Introduction to Microcontrollers

Algorithms and flowchart

Computer Languages (High, Middle and Low level languages)

Internet and its applications-

Introduction to Internet, its History and applications.

Basic services of Internet (ELECTRONIC MAIL, TELNET, INTRANET, EXTRANET)

Protocols (FTP, SMTP, TCP/IP, PPP etc.)

Introduction to World Wide Web and Browsers

Reference Books:

1. V.K. Puri , Digital Electronics circuits and systems, TMH Publication, 2001
2. P.K. Sinha , Computer Fundamentals , BPB Publications , 2007

Subject I DSC II : Drawing and Sketching (Credits-02)

Course Objectives: Students Should:

1. Learn the art of pencil drawing, toning and shading of different grade of professional sketching pencils.
2. Study method of using different grade of pencil to do sketching, shading and toning.
3. Learn the techniques of fine pencil drawing to explore different fine art subjects such as animals, birds, flowers, insect, still life, etc.
4. Explore the use of pencil and various tools to create textures for different subjects.

Unit- I

Introduction to Drawing and sketching, History of drawing and sketching

Various categories of drawing and sketching History of pencil, types of a Pencil, Instruments used in Drawing. Visual and creative development of an artist, How to draw gestures, Basic Proportions , Heads, Rotation in Arcs ,Key Lines ,Perspective and its types , Introduction of Calligraphy, types ofcalligraphy, History of logo and how to design a Logo.

Unit-II

Mannequin, Volume Construction, Balance, Muscles, Light & shade, Shape and Action Hands & Legs ,Foreshortening ,Facial expressions .Introduction to pose to pose sketching (Action analysis. Introduction to Acting, Modeling, Sketching from Acting, Sketching from live models, Introduction to Rapid Sketching Techniques, Sketching from Memory, live action.

Reference Books:-

1. Richards Williams , The Animator Survival Kit, 2001 (Faber and Faber)
2. Richards Box , Basic Drawing Techniques, May 1, 2000
3. Victor Petard , Drawing and Anatomy , 1928
4. Preston Blair, Cartoon Animation.

Subject I Practical I:	Drawing and Sketching Lab

1. Free hand sketching from real objects:
2. Building, vehicles, chair, table, trees etc.
3. Sketching from live models
4. How to draw gestures, Basic Proportions, Heads, Rotation in Arcs
5. Facial expressions
6. Basic Head Drawings male, female, children, old person
7. Draws Text, letters, logos.
8. Draw BG (Backgrounds) Layouts for Animation.
9. Realistic Human Drawings, Anatomy. Animal Drawings
10. Cartoons and Comic Drawings.

B. Sc. Animation (Entire) (Part I) (Level 4.5) (Semester – I)
(NEP-2020)
MATHEMATICS
Syllabus to be implemented from Academic Year 2024-25

Course type	**:**	**DSC – I**
Title of course	**:**	**Foundation of Mathematics**
Credits	**:**	**02**

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. find solution of system of linear equations.
CO 2. understand applications of Leibnitz's theorem.
CO 3. find series expansion of some standard functions.
CO 4. understand mean value theorem and geometric interpretation.

Unit 1: Matrices **08 hrs.**

1.1 Adjoint of matrix
1.2 Inverse of Matrix
1.3 Solution of system of linear equations
  1.3.1 Gauss elimination method
  1.3.2 Gauss Jordan Method
1.4 Eigen values and Eigen vectors of a matrix

Unit 2: Successive Differentiation **8 hrs.**

1.1. n^{th} order derivative of some standard functions:
(i) $(ax + b)^n$ (ii) $1/(ax + b)$ (iii) $\log (ax + b)$ (iv) e^{ax} (v) a^{mx} (vi) $\sin(ax + b)$ (vii) $\cos(ax + b)$ (viii) $e^{ax} \sin(bx + c)$ (ix) $e^{ax} \cos(bx + c)$.
1.2. Leibnitz's theorem and it's applications

Unit 3: Taylor's and Maclaurin's Theorems: **6 hrs.**

3.1 Taylor's and Maclaurin's Theorems with Lagrange's and Cauchy's forms of Remainders (without proof)
3.2 Taylor's and Maclaurin's series
3.3 Series expansions of e^x, sin x, cos x, log(1+x) etc.

Unit 4: Mean Value Theorems **8 hrs.**

4.1 Introduction
4.2 Rolle's theorem and its geometrical interpretation
4.3 Lagrange's mean value theorem and its geometrical interpretation
4.4 Cauchy's mean value theorem and its geometrical interpretation
4.5 Examples

Reference Books:

1. Elementary Linear Algebra, Applications Version : Howard Anton and Chris Rorres 11th edition, 2014 Wiley.
2. Shanti Narayan : Differential Calculus, S. Chand Publishing, 2005

3. H.T.Dinde, A.D. Lokhande, P.D.Sutar, U.H.Naik: A Text Book Of Calculus And Differential Equations, Published by SUMS, 2003.
4. S.V. Babar, D. R. Phadatare, G.D. Shelake, S. S. Khopade, A text book of Calculus, Published by Nirali Prakashan, 2022.

B. Sc. Animation (Entire) (Part I) (Level 4.5) (Semester – I)
(NEP-2020)
MATHEMATICS
Syllabus to be implemented from Academic Year 2024-25

Course type : DSC – II
Title of course : Basic Algebra
Credits : 02

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. apply fundamental concepts in Number theory to solve problems on congruence.
CO 2. solve problems based on Fermat's theorem and residue classes.
CO 3. use fundamental concepts in Mathematics like sets, relations and functions.
CO 4. learn basic concepts like poset, lattice, Boolean algebra and apply them to find CNF and DNF.

Unit 1: Relations **8 hrs.**

1.1. Ordered pairs, Cartesian product.
1.2. Relations, Types of relations, Equivalence relation, Partial ordering relation, Examples.
1.3. Digraphs of relations, matrix representation and composion of Relations, Examples.
1.4. Transitive closure, Warshall's algorithm, Examples.
1.5. Equivalence class, Partition of a set.

Unit 2: Boolean algebra **8 hrs.**

2.1. Hasse diagram.
2.2. Lattice: Definition, principle of duality.
2.3. Basic properties of algebraic systems defined by Lattices.
2.4. Distributive and complemented lattices.
2.5. Boolean lattices and Boolean algebras.
2.6. Boolean expressions and Boolean functions.
2.7. Disjunctive and conjunctive normal forms and examples.

Unit 3: Divisibility of integers **8 hrs.**

1.1. Introduction
1.2. Divisibility: Division algorithm (Statement only).
1.3. Greatest Common Divisor (GCD), Least Common Multiple (LCM), examples.
1.4. Euclidean algorithm, examples.
1.5. Prime numbers, Euclides Lemma, Fundamental theorem of Arithmetic (without proof), examples.

Unit 4: Congruence relation **6 hrs.**

4.1. Congruence relation and its properties
4.2. Fermat's Theorem (Statement only), examples.
4.3. Residue Classes: Definition, addition modulo n, multiplication modulo n, Examples.

Reference Books:

1. Algebra by S. R. Patil and Others Nirali Prakashan.
2. Algebra by Bhopatkar, Nimbkar, Joglekar, VISION Publication.
3. Algebra by Naik and Patil, PHADAKE Prakashan.
4. A Foundation Course in Mathematics, Ajit Kumar, S. Kumeresan and Bhaba Kumar Sarma, Narosa Publication House.
5. Elementary Number Theory, Seventh edition: David M. Burton, McGraw-Hill.
6. Lattices & Boolean Algebras: First Concepts by V. K. Khanna, Vikas Publishing House, Second Edition, 2008

B. Sc. Animation (Entire) (Part I) (Level 4.5) (Semester – I)
(NEP-2020)
MATHEMATICS
Syllabus to be implemented from Academic Year 2024-25

Course type : Lab course I
Title of course : Mathematics Laboratory course – I
Credits : 02
Batch : One batch of 20 students.
Student Engagement : 4 hrs. per week per batch

Pr. No	Title of the Practical	No. of Practical
1.	Gauss elimination method	1
2.	Gauss Jordan Method	1
3.	Eigen values and Eigen vectors of a matrix	1
4.	Taylor's and Maclaurin's series	1
5.	Rolle's theorem	1
6.	Lagrange's mean value theorem	1
7.	Cauchy's mean value theorem	1
8.	Warshall's algorithm	1
9.	Disjunctive and Conjunctive normal forms (DNF & CNF)	1
10.	Euclidean algorithm	1

11.	Fermat's theorem	1
12.	C – Programs: finding g. c. d and l. c. m., determination of primes	1
13.	C – program for Euclidean algorithm	1
14.	C – program to determine the value of φ (*n*) (Euler φ function).	1

Subject III DSC I: Fundamental Electronics (Credits-02)

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

CO1: Understand the concept of electronics components.CO2: Understand the transistor Applications.

CO3: To study and understand the amplifier and oscillator concept.

CO4: To study the concept of operational amplifier and Integrated circuit.

Units	Contents	Hours
1.	**A) Linear Components in Computer:** **Resistors:** Classification of resistors, Symbols, color code method and its applications, **Capacitors**: Classification of capacitors, Symbols, electrolyte capacitor, applications of capacitor, **Inductors**: types of inductors, Symbols, its applications, **Diodes:** Types of diodes, Symbols, Forward biasing & reverse biasing of PN junction diode, Zener diode, LED diode, Applications of diodes, **B) Bipolar Junction Transistor:** Types of Transistors, Symbols, Construction details & working of NPN & PNP transistors, Operating modes of transistor, Transistor configurations: CB, CC, CE, Comparison between CB, CC & CE, Input-Output characteristics of Transistor in CE mode, Biasing of a Transistor: Voltage divider bias, Emitter bias, Applications: Transistor as an Amplifier, Transistor as an Electronic Switch,	15
2.	**A) BJT Amplifiers:** Classification of **Amplifiers** (based on frequency range, Q point, coupling & stages), Single stage amplifier & Need of Multistage amplifier, Coupling Scheme: Direct, RC, LC coupling in detail) (only circuits using transistors & frequency response), class-A, class-B, class-C & class-AB amplifiers, Applications of Amplifiers, **B) Operational Amplifier:** Concept of Differential amplifier, Definition of Operational Amplifier, Internal block diagram of Op-Amp **IC-741**, Symbol & Pin diagram of IC-741**,** Ideal & Practical characteristics/parameters of Op-Amp IC-741, Configurations of Op-Amp: Open-Loop & Closed Loop, **Linear & Nonlinear applications of Op-Amp**: Inverting mode amplifier, Virtual ground, Sign changer(Inverter), Non-inverting mode amplifier, Unity gain amplifier, Op-Amp Adder, Op-Amp-Subtractor, Op-Amp Comparators, Zero crossing detector, Schmitt Trigger,	15

Reference Books:

1. Principles of Electronics: by V. K. Meheta, S. Chand & Company Ltd.
2. Basic Electronics and Linear Circuits : by N. N. Bhargava, D. C. Kulshreshtha, S. C. Gupta,
3. Electronic Devices and circuits: by Robert Boylstead, Tata Mc-Graw Hill.
4. Linear Integrated Circuits: by Ramakant Gaikwad,
5. Principles of Electronics: by A.P.Malvino, Tata Mc-Graw Hill Publication,

Subject III DSC II: Basic Digital Electronics (Credits- **Course Outcomes (COs): On completion of the course, the students will be able to:**

CO1 Understand the concept of Number Systems,CO2 Understand different Computer Codes,
CO3 Understand different Logic Gates & Boolean Algebra,CO4 Understand various Combinational Logic circuits,

Unit	Contents	Hours
1	**A) Number Systems :** Introduction and definition, Classification (Weighted & Non-Weighted), Weighted Number System s: Binary Number System, Decimal Number System, Octal Number System, Hexadecimal Number System, Conversion of Numbers from one system to another system., Binary Arithmetic, 1's & 2's complement of binary numbers. Subtraction by 1's complement & 2's Complement. **B) Computer Codes**: Introduction and definition, BCD code : (4-bit packed BCD, unpacked BCD), EBCDIC code , ASCII code: (ASCII – 7, ASCII-8), Gray Code, Unicode, Concept of Parity bit, Even parity, Odd parity, Signed number and Unsigned number representation.	**15**
2	**A) Logic Gates:** Definition, AND, OR, NOT, NOR, NAND, EX-OR (Symbol, Boolean Expression and Truth Table), Boolean algebra and Identities, De Morgan's theorems. Universal logic Gates (NAND and NOR), SOP expression & POS expression, Minterms & Maxterms, Drawing circuits from Boolean equations, Reduction of Boolean Equations by using Boolean laws, Introduction to K – map techniques with examples, **B) Combinational Circuits:** Introduction, Half adder, Full Adder, Half Subtractor, Full Subtractor, Parallel adder, Universal Adder & Subtractor, Encoder (decimal to BCD), Priority Encoder, Decoder (BCD-Decimal), Multiplexer & De-multiplexer,	**15**

Reference Books:

1. Digital Principles and Applications: by Malvino Leach, Tata McGraw Hill.
2. Fundamentals of Digital Electronics: by Anand Kumar, PHI Publication.
3. Digital Principles: by T. L. Floyd 3rd edition
4. Digital Electronics: by R. P Jain.

B.Sc. Animation (Entire) (Part-I) (Semester-I) (NEP) Practical-I, (Electronics Practicals based on DSC-I & DSC-II)	
Sr. No.	**Name of the Practicals**
1	Study of various Electronic components, equipment's & measuring devices.
2	Study of measurement of Amplitude, Frequency & Phase of waveforms by using CRO.
3	Study of PN junction diode (Forward biasing & Reverse Biasing).
4	Study of Transistor working as Electronic switch (Use LED & Relay in the circuit)
5	Study of Inverting mode Amplifier by using Op-Amp IC-741.
6	Study of Non-inverting mode amplifier by using Op-Amp IC-741.
7	Study of Op-Amp Adder by using IC741.
8	Study of Op-Amp Subtractor by using IC741.
9	Study of Basic Logic gates.
10	Study of Universal Logic gate (NAND gate).
11	Study of Universal Logic gate(NOR gate).
12	Study of DeMorgan's Theorems.
13	Study of Half Adder.
14	Study of Full Adder.
15	Study of Half Subtractor,
16	Study of Full Subtractor.
17	Study of Encoder (Decimal to BCD).
18	Study of Decoder (BCD to Decimal).
19	Study of Multiplexer (4:1 or 8:1).
20	Study of DeMultiplexer (1:4 or 1:8).

OE - I	Basics of Management

Course Objective: Students Should:

Course code : IKS I
Title of course : Vedic Mathematics
Theory : 30
Marks : 50
Credit : 02

Course Outcomes:

1. By successfully completing this course, the learner will be able to:
2. Perform simple arithmetic calculations with speed and accuracy
3. Will be able to generate tables of any number

UNIT I **(15 HOURS)**

Introduction to Vedas, History of Vedas, History and Evolution of Vedic Mathematics Introduction of Basic Vedic Mathematics, Techniques in Multiplication, Special Case, Tables etc. Various techniques to carry out basic operations covering Addition, Subtraction, Multiplication, Division, Complements and Bases, Vinculum number. Comparison of Standard Methods with Vedic Methods

UNIT II **(15 HOURS)**

General multiplication (Vertically Cross- wise), Multiplications by numbers nearbase. Verifying answers by use of digital roots, Divisibility tests, Division of numbers near base, Comparison of fractions.Different methods of Squares (General method, Basemethod, Duplex method etc.)Cubes, Cube roots, Square Roots, General division.Quadratic Equations, Simultaneous Equations, Use of various Vedic Techniques for answering numerical aptitude questions from Competitive Examinations

Reference Books:

1. Bhatiya Dhaval, Vedic Mathematics Made Easy, Jaico Publishing House
2. Thakur Rajesh Kumar, Vedic Mathematics for students taking Competitive Examinations

Subject I DSC III:: Color Theory (Credits-02)

Course Objectives: Students Should:

1. Demonstrate an understanding of basic color theory concepts including:
   - Hue, Value, and Saturation
   - 12 step color wheel color temperature
   - (Warm/Cool)
   - Tint, Tone, Shade (Value Manipulation)
   - Color Harmonies (Analogous Color)
   - Color Contrasts (Complementary Color)
   - Simultaneous Contrast Effects/Color Contextuality
   - Bezold Effect Optical Mixing
2. Demonstrate the ability to discern, control, and apply color through hand mixing of gouache paint and digital media where applicable.
3. Learn refine quality of visual presentation through observation, questioning, self-evaluation, and revision.
4. Participate in critiques relating specific project objectives to completed projects.

Unit -I

Introduction of color science, History of Color, Introduction of materials,
History of Printing Media, Range of visible spectrum, Color Terminology, Physics, Color imetry, and Psychophysics, Computational Theories of Color Vision, Comparative Color Vision and Evolution, Dispositions, Dispositional Theories of Color , Color Eliminativism, Functionalist Primary Quality Theories of Color , Spectrum Inversions ,Color Ontology, Color psychology.

Unit -II

Color Vision ,Color Gamma, Interactions of Gradation and contrast, Warm and cool Colour, Mixing of primary, Secondary, Tertiary Colors, Tints, Tones and Shades, Making Color Wheel ,Making composition with colors, Color Journal.Color Harmony, Aesthetic response to Harmonious color, Phenomenon of after images, After images and attributes of color, Albert Munsell's theory of balanced color, Definition of balanced color, Creating Harmony in color, Effects of light, Color Constancy, Simultaneous Contrast, Color symbolism, Attaching noses to colors, Using Colors to express meaning, Symbolic meaning of colors,

Reference Books:-

1. José María Parramón, Color Theory (Watson- Guptil‟s Artist Library)
2. Byrne and Hilbert volume 2, "Introduction"; Hardin, Color For Philosophers.
3. Nassau, "The Causes of Color"; MacAdam, "The Physical Basis of Color Specification"; Hurvich, Color Vision.
4. Land, "Recent Advances in Retinex Theory"; Wandell, "Color Constancy and the Natural Image".

Subject I DSC IV: Multimedia and Animation graphics (Credits-02)

Course Objectives: Students Should:

1. Understand the History of computer graphics, graphics architectures and software, imaging: pinhole camera, human vision, synthetic camera, modelling vs rendering.
2. learn and master the necessary skills in order to apply the most advanced technologies in computer graphics and multimedia systems
3. Study OpenGL: architecture, displaying simple two-dimensional geometric objects, positioning systems, working in a windowed environment.
4. Study Geometric transformations, affine transformations (translation, rotation, scaling, shear), homogeneous coordinates, concatenation, current transformation and matrix stacks.

Unit-I

Multimedia Communications

What is Multimedia? Multimedia Components and its applications

Multimedia networks,

Applications of networking terminology

Text and image compression

Multimedia information representation: Digitization, Principles , Text and Images,
Audio and video.

Unit-II

Introduction to Computer Graphics

Introduction to compression methods, Image types, Image compression
Various methods of text and image compression.

(2 Dimensional)

Definition of 2 D Dimensional , Pixel and Frame Buffer, Raster and Random Scan display
Display devices-CRT, Color CRT Monitors Scan.
2-Dimensional transformation, Translation, Rotation, Scaling,

Reference Books:

1. Fred Halsall , Multimedia Communications- Applications, Networks, Protocols & Standards, Pearson Publications 1 January 2001.
2. Zhigang Xiang and Roy Plasock , Computer Graphics , Tata McGraw Hill
3. K.R. Rao, Zoran S.B. & Dragorad A.M. , Multimedia Communication Systems – PHI Publications

Subject I Practical II:	Color Theory Lab

1. Primary, Secondary, Tartary, Quarter Class Colour Scheme
2. Making 6, 12, 18 parts of Colour Wheel
3. Relationship between Different colour Schemes
4. Still life painting
5. Memory painting
6. Tints, Shades and Tones.
7. Monochromatic Composition.
8. Complementary and analogous color scheme.
9. Hue and Saturation.
10. How to Mix Paint.
11. Subjective color
12. Transforming color using complements and three attributes-Hue value and intensity.
13. Color of human emotions,
14. Color symbolism,
15. Mixing of color

B. Sc. Animation (Entire) (Part I) (Level 4.5) (Semester – II)
(NEP-2020)
MATHEMATICS
Syllabus to be implemented from Academic Year 2024-25

Course type : DSC – III
Title of course : Numerical Methods
Credits : 02

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. find solution to algebraic and transcendental equations.
CO 2. estimate the missing terms through interpolation methods.
CO 3. apply numerical methods to find Solution of linear systems.
CO 4. find the solution of ordinary differential equation.

Unit 1: Solution to Algebraic and Transcendental Equations 8 hrs

1.1 Errors, Absolute Error, Relative Error, Percentage Error.
1.2 Solution to Algebraic and Transcendental Equations
1.2.1 Bisection Method
1.2.2. Method of False Position
1.2.3 Newton – Raphson Method

Unit 2: Interpolation 7 hrs

2.1 Forward Difference, Backward Difference
2.2 Newton's Forward Difference Interpolation
2.3 Newton's Backward Difference Interpolation
2.4 Lagrange's Interpolation.
2.5 Least – Square Curve Fitting Method, Fitting a straight line, Fitting parabola.

Unit 3: Simultaneous Algebraic Linear Equations 7 hrs

3.1 Cramer's Rule
3.2 LU Decomposition Method
3.3 Solution of linear systems by Iterative Method.

Unit 4: Ordinary Differential Equations & Numerical Integration 8 hrs

4.1 Numerical solution of 1st and 2nd order differential equations
4.2 Taylor Series, Euler's Method
4.3 Euler's Modified Method
4.4 Runge – Kutta Method (2nd, 4th order)

Reference Books:

1. S.S. Sastry: Introduction Methods of Numerical Analysis, PHI.
2. V. Rajaraman: Computer Oriented Numerical Methods.
3. Balguruswami: Numerical Methods, PHI.
4. Mathews: Numerical Methods for Scientist & Engineers, PHI.
5. teven C: Numerical Methods for Engineers with programming and Software Applications.

B. Sc. Animation (Entire) (Part I) (Level 4.5) (Semester – II)
(NEP-2020)
MATHEMATICS
Syllabus to be implemented from Academic Year 2024-25

Course type : DSC – IV
Title of course : Graph theory
Credits : 02

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. achieve command of the fundamental definitions and concepts of graph theory.
CO 2. model problems using graphs and solve these problems algorithmically.
CO 3. illustrate fundamentals of spanning tree, circuits and cut-sets.
CO 4. apply this knowledge in (especially) computer science applications.

Unit 1: Graphs and operations on graphs 9 hrs.

1.1. Definition and elementary results
1.2. Types of graphs
1.3. Isomorphism
1.4. Matrix representation of graphs: Adjacency matrix and incidence matrix
1.5. Subgraphs and induced graphs
1.6. Complement of a graph, self complementary graphs
1.7. Union, intersection of graphs, Ring sum of two graphs

Unit 2: Path 6 hrs.

2.1. Definitions: walk, trail, tour, path and circuit,
2.2. Definitions of connected, disconnected graphs
2.3. Dijkstra's shortest path algorithm
2.4. Connectivity: Isthmus, cut-vertex, Edge connectivity & vertex connectivity.

Unit 3: Tree 9 hrs.

1.1. Tree: Definition
1.2. Properties of Trees:
  1.2.1. Theorem: A tree with n vertices has n -1 edges.
  1.2.2. Theorem: A connected graph G with n vertices and n - 1 edges is a tree
  1.2.3. Theorem: A graph with n vertices is a tree if and only if it is circuit free and has n - 1 edges.
  1.2.4. Theorem: A graph G is a tree if and only if it is minimally connected.
1.3. Centre of a tree
1.4. Spanning tree: Definition and examples

Unit 4: Kruskal's algorithm 6 hrs.

4.1. Fundamental circuit and cut-set: Definition, examples.
4.2. Binary trees and elementary results, examples.
4.3. Kruskal's algorithm, examples

Reference Books:

1. Discrete Mathematics by Kenneth Rosen, Tata McGraw Hill
2. Graph Theory with Applications to Computer Sc. & Engg. by Narsing Deo, PHI, 2009
3. A First Step in Graph Theory by Raghunathan, Nimkar and Solapurrkar
4. Discrete mathematics by S.R.Patil and others, NIRALI Prakashan.
5. Discrete mathematics by Bhopatkar, Nimbkar, Joglekar, VISION Publication.
6. Introduction to Graph theory by S. Arumugham and S. Ramachandran, published by Scitech Publications, Chennai-17
7. Introduction to Graph Theory, Mamta Chaudhary, Vani Sharma and Pooja Yadav, Sultan Chand & Sons, Educational Publishers, New Delhi.

B. Sc. Animation (Entire) (Part I) (Level 4.5) (Semester – II)
(NEP-2020)
MATHEMATICS
Syllabus to be implemented from Academic Year 2024-25

Course type : Lab course II
Title of course : Mathematics Laboratory course – II
Credits : 02
Batch : One batch of 20 students.
Student Engagement : 4 hrs. per week per batch

Pr. No	Title of the Practical	No. of Practical
1.	Union, intersection & Ring sum of two graphs	1
2.	Dijkstra's Shortest path algorithm	1
3.	Fundamental circuit and fundamental cut set	1
4.	Kruskal's algorithm	1
5.	Errors, Absolute Error, Relative Error, Percentage Error	1
6.	Solution to Algebraic and Transcendental Equations	1
7.	Newton's Forward and Backward Difference Interpolation	1
8.	Lagrange's Interpolation.	1
9.	Cramer's Rule, LU Decomposition Method	1
10.	Solution of linear systems by Iterative Method	1
11.	Euler's Method, Euler's Modified Method	1

12.	Runge – Kutta Method (2nd, 4th order)	1
13.	C-program for Bisection Method	1
14.	C-program for Gauss elimination method	1

Subject III DSC III: Sensors and Signal Conditioning (Credits-02)

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

CO1: Understand different types of Sensors & Transducers..

CO2: Understand Signal conditioning methods & data convertor used in Instrumentation systems.CO3: Get a knowledge of different Actuators, DAS systems & Data loggers in Instrumentation. CO4: Understand the Digital Instruments & Digital displays.

Units	Contents	Hours
1.	**A) Sensors & Transducers:** Definition of Transducers & Sensors, Classification of transducers & Sensors, Characteristics of Transducers, Specifications of Transducers (Accuracy, Range, Linearity, Sensitivity, Resolution, Reproduciability), Temperature: Thermocouple, RTD, LM35, Pressure/ Force: Common type Load cell, LVDT, Capacitive, Optical: LDR, Photovoltaic Cell, Proximity: Hall effect sensor, Ultrasonic sensor, PIR (passive Infrared sensor), **B) Signal Conditioning & Data Convertors:** Introduction, Signal conditioning of passive sensors using Wheatstone's bridge, Pre-Amplifiers, **Filters**: Concept, Active filters, Passive Filters (LowPass, HighPass, Band-Pass and Band-Reject filter- only frequency response), **Digital Signal conditioning**: Types of **ADC:** SAR-ADC , Specifications of ADC (Linearity, Resolution, Conversion time, Accuracy), Types of **DAC:** R-2R Ladder DAC, Specifications of DAC (Linearity, Resolution, Accuracy), **Analog Signal Conditioning**: Instrumentation Amplifier using three Op-Amp,	**15**
2.	**A) Actuators & Data Acquisition Systems:** Definition of Actuators, Types of Actuators, Electrical Actuators: Relays, Motors: AC, DC, Servo, Stepper, **Data Acquisition System**s: Generalized DAS system, Signal conditioning for DAS, Types of DAS systems, Multiplexing, Sample and Hold Circuit, Computer based DAS system, Data Logger. **B) Digital Instruments & Display devices:** Digital Multimeter, Digital Frequency Meter, Digital Universal Counter, Digital Tachometer, Concept of Digital Storage Oscilloscope, Displays: LCD display, LED Display.	**15**

Reference Books:

1. Electronic Instrumentation: by Kalsi, TMH
2. Transducers & Instrumentation: by Murthy PHI (Unit1)
3. Instrumentation Measurements & Analysis: by Nakra & Chaudhary TMH
4. Instrumentation Devices & Systems: by Rangan, Sharma, Mani, TMH

Subject III DSC IV: Advanced Digital Electronics (Credits-02)

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

CO1 Understand the Sequential Circuits like Flip-Flop,
CO2 Understand the various digital Counters & Shift registers,CO3 Understand 8-bit Microprocessor-8085 architecture,
CO4 Understand 8085-microprocessor Instruction set & assembly language programming.

Unit	Contents	Hours
1	**A) Sequential Circuits:** Concept of Sequential circuits **:** types of **Flip-flops**: RS flip-flop (NAND & NOR), Clocked RS flip-flop, D flip-flop, Edge-triggering & Level Triggering, JK flip-flop, Master-Slave JK flip-flop, PRESET & CLEAR inputs in a Flip-flop, **B) Counters & Shift Registers:** Types of counters**,** concept of Synchronous counters**,** Asynchronous counters, 4-bit Ripple counter, Up-Down counter (3-bit), Modulus-N counter, Construction of mod-5, mod-10 counter, Shift Registers: SISO, SIPO, PISO, PIPO, Ring counter, Johnson Counter,	**15**
2	**A) Semiconductor memories:** Classification of memories, Static RAM, Dynamic RAM, ROM, EPROM, E2PROM, Flash memory, Comparison: Static RAM vs Dynamic RAM, E2PROM vs Flash, Characteristics of memory, Memory hierarchy, Cache memory, Virtual Memory, Memory management concepts (Paging &Segmentation), Introduction to USB storage devices, **B) Introduction to Microprocessors:** General block diagram, Introduction & evolution of Microprocessors (4, 8, 16, 32Bits), 8-bit Microprocessor (8085): Pin Diagram of 8085, Features of 8085, Internal Architecture of 8085, Instruction Set of 8085 & Programming: types of Instructions, Instruction format, addressing modes, Assembly language programming: for Data transfer, Addition, Subtraction, Multiplication, Division, Memory Block Transfer & Block Exchange operations, shifting of bits.	**15**

Reference Books:

1. Microprocessors-8085: by Ramesh Gaonkar,
2. Microprocessor -8085: by Vibhute & Borule,
3. Digital Principles and Applications: by Malvino Leach, Tata McGraw Hill.
4. Fundamentals of Digital Electronics: by Anand Kumar, PHI Publication.
5. Digital Principles: by T. L. Floyd 3rd edition
6. Digital Electronics: by R. P Jain,

Subject III Practical II:	Based on Subject III DSC III and Subject III DSC IV

Sr. No.	Titles of the Practicals
1	Study of R-2R Ladder DAC.
2	Study of Instrumentation amplifier using three Op-Amps.
3	Study of Asynchronous Up counter.
4	Study of Universal Shift register.
5	Study of Ring Counter & Johnson Counter,
6	Write ALP for Addition of two 8 bit numbers.
7	Write ALP for Addition of two 16 bit numbers.
8	Write ALP for Subtraction of two 8 bit numbers.
9	Write ALP for Subtraction of two 16 bit numbers.
10	Write ALP for Multiplication of two 8 bit numbers.
11	Write ALP for Division of two 8 bit numbers.
12	Write ALP for Memory block transfer.
13	Write ALP to find the largest number.
14	Write ALP to find the smallest number.
15	Write ALP to find Odd number or Even number.
16	Write ALP to find 1's complement of 8 bit number.
17	Write ALP to find 1's complement of 16 bit number.
18	Write ALP to find 2's complement of 8 bit number.
19	Write ALP to shift 8 bit number to the left by 1 bit & 2 bits.
20	Write ALP to shift 8 bit number to the right by 1 bit & 2 bits.

OE – II	Improving reading comprehension

VEC– I	Democracy, Election and Constitution