MANAV RACHNA UNIVERSITY

FACULTY OF EDUCATION & HUMANITIES

DEPARTMENT OF EDUCATION & HUMANITIES

PROGRAM STRUCTURE

&

DETAILED SYLLABUS

B.Sc. B.Ed.

BATCH: 2018-2022

MANAV RACHNA UNIVERSITY
DEPARTMENT OF EDUCATION
B.Sc B.Ed (2018-22)

SEMESTER - 1										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/ Workshop/ NTCC)**	**COURSE TYPE (Core/Elective / University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
CHH135-T	Atomic Structure and Bonding	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH135-P	Atomic Structure and Bonding Lab				0	0	2	0		
PHH121-T	Physics-I	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH121-P	Physics-I Lab				0	0	2	0		
EDH113-T	Diversity of Microbes and Thallophytes	EDU			3	0	0	0	5	
EDH113-P	Diversity of Microbes and Thallophytes Lab				0	0	2	0		
MAH145-T	Differential Calculus and Analytical Geometry	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH145-P	Differential Calculus and Analytical Geometry Lab				0	0	2	0		
EDH114-T	Animal Diversity-I	EDU			3	0	0	0	5	
EDH114-P	Animal Diversity-I Lab				0	0	2	0		
EDH102-T	Foundation of Education	EDU	HARD	CORE	3	0	0	0	5	4
EDH102-P	Foundation of Education Lab				0	0	2	0		
MOOC-18E-EDS-101/ 103	Developing of Soft Skills and Personality/Better Spoken English	EDU	MOOC	CORE	0	0	0	0	0	2
EDS116	Communicative English- I		SOFT		1	0	2	0	3	
CSW114B	Critical Understanding of ICT in Education-I	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDO144	Co Curricular Activities	EDU	NTCC	UNIVERSITY COMPULSORY	0	0	0	2	2	0.5
CHH137	Environmental Science	CHH	NTCC	UNIVERSITY COMPULSORY	2	0	0	2	2	4
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				15	PCM)/1(ZB	PCM)/13(Z	4	33(PCM)/ZBC	24 (PCM)/24(ZBC)

SEMESTER - 2										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE**	**COURSE TYPE (Core/Elective /**	**L**	**T**	**P**	**O**	**NO. OF CONTACT**	**NO. OF CREDITS**

CHH136-T	States of Matter and Nuclear Chemistry	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH136-P	States of Matter and Nuclear Chemistry Lab				0	0	2	0		
PHH122-T	Elasticity, Waves, Heat and Thermodynamics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH122-P	Elasticity, Waves, Heat and Thermodynamics Lab				0	0	2	0		
EDH132-T	Bryophytes and Pteridophytes	EDU			3	0	0	0	5	
EDH132-P	Bryophytes and Pteridophytes Lab				0	0	2	0		
MAH147-T	Partial Differentiations and Integral Calculus	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH147-P	Partial Differentiations and Integral Calculus Lab				0	0	2	0		
EDH131-T	Animal Diversity-II	Partial Differentiations and Integral Calculus+A28:B44			3	0	0	0	5	
EDH131-P	Animal Diversity-II Lab				0	0	2	0		
MAH146-T	Number Theory, Theory of Equations and Matrices	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH146-P	Number Theory, Theory of Equations and Matrices Lab				0	0	2	0		
EDH133-T	Learner and Learning Process	EDU	HARD	CORE	3	0	0	0	5	4
EDH133-P	Learner and Learning Process Lab				0	0	2	0		
EDS103	Creating An Inclusive Classroom	EDU	SOFT	CORE	1	0	2	0	3	2
MOOC-18E-EDS-103	Better Spoken English/ Speaking Effectively	EDU	MOOC	CORE	0	0	0	2	0	2
EDS134	Communicative English-II		SOFT	CORE	1	0	2	0	3	
CSW115B	Critical Understanding of ICT-II	CST	WORKSHOP	CORE	0	0	3	0	3	1.5
EDW125	Drama and Art Education	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDN136	Project Report on Field Trip	EDU	NTCC	UNIVERSITY COMPULSORY	0	0	0	0	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				PCM)/14(Z	PCM)/1(ZB	PCM)/18(Z	2	43(PCM)/35(ZBC)	29(PCM)/25 (ZBC)

POST SECOND SEMESTER SUMMER TRAINING (EDO165) (1.5 Credits)

SEMESTER - 3

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE	COURSE TYPE (Core/Elective	L	T	P	O	NO. OF CONTACT	NO. OF CREDITS
CHH237-T	Organic Chemistry I	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4

CHH237-P	Organic Chemistry I Lab	APPLIED SCIENCE	HARD	CORE	0	0	2	0	6	4
PHH226-T	Electricity and Electromagnetism	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH226-P	Electricity and Electromagnetism Lab				0	0	2	0		
EDH204-T	Gymnosperms and Reproduction in Angiosperms	EDU			3	0	0	0	5	
EDH204-P	Gymnosperms and Reproduction in Angiosperms Lab				0	0	2	0		
MAH248-T	Real Analysis	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH248-P	Real Analysis Lab				0	0	2	0		
EDH205-T	Animal Diversity-III and Comparitive Anatomy of Vertebrates	EDU			3	0	0	0	5	
EDH205-P	Animal Diversity-III and Comparitive Anatomy of Vertebrates Lab				0	0	2	0		
EDH221-T	Basics of Biophysics and Instrumentation	EDU	HARD	CORE	3	0	0	0	5	4
EDH221-P	Basics of Biophysics and Instrumentation Lab				0	0	2	0		
EDH206-T	Knowledge and Curriculum	EDU	HARD	CORE	3	0	0	0	5	4
EDH206-P	Knowledge and Curriculum Lab				0	0	2	0		
EDS207	Gender, school and society	EDU	SOFT	CORE	1	0	2	0	3	2
EDW208	Craft and visual arts	EDU	WORKSHOP	CORE	0	0	3	0	3	2
FLS101	Spanish-I	MRCFL	ELECTIVE	UNIVERSITY COMPULSORY	1	1	0	0	2	0
FLS102	German-I									
FLS103	French-I									
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				(PCM)/(ZBCM)/ 1 (Z		15	0	36(PCM)/33(ZBC)	24

Under Choice based Credit system, a basket of electives will b offered from which one electives will taken by the student

SEMESTER - 4

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE	COURSE TYPE (Core/Elective	L	T	P	O	NO. OF CONTACT	NO. OF CREDITS
CHH238-T	Thermodynamics, Equilibrium and Solutions	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH238-P	Thermodynamics, Equilibrium and Solutions Lab				0	0	2	0		
CHH313-T	Organic Chemistry II	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH313-P	Organic Chemistry II Lab				0	0	2	0		
PHH227-T	Optics	APPLIED SCIENCE			3	1	0	0	6	

PHH227-P	Optic sLab	APPLIED SCIENCE	HARD	CORE	0	0	2	0	0	4
EDH224-T	Angiosperm Anatomy; Ecology and Evolution	EDU			3	0	0	0	5	
EDH224-P	Angiosperm Anatomy; Ecology and Evolution Lab				0	0	2	0		
MAH249 T	Differential Equation	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH249 P	Differential Equation Lab				0	0	2	0		
EDH225-T	Animal Physiology and Endocrinology	EDU			3	0	0	0	5	
EDH225-P	Animal Physiology and Endocrinology Lab				0	0	2	0		
EDH122-T	Assessment For Learning	EDU	HARD	CORE	3	0	0	0	5	4
EDH122-P	Assessment For Learning Lab				0	0	2	0		

EDS227	School Organization & Management	EDU	SOFT	CORE	1	0	2	0	3	2
EDW 228	e-learning	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
MOOC-18E-EDN-205	Design Thinking- A Primer	EDU	MOOC	CORE	0	0	0	3	3	1.5
EDN229	Street Play/ Skit/ Mime		Workshop	CORE	1	0	2	0		
MOOC-18E-EDS-204	Principles of Human Resource Management	MGT	MOOC	CORE	0	0	0	3	3	2
MCS231/232	Basics of Economics/ Introduction to Finance		SOFT	Elective	1	0	2	0		
FLS105	Spanish-II	MRCFL	ELECTIVE	UNIVERSITY COMPULSORY	1	1	0	0	2	0
FLS106	German-II									
FLS107	French-II									
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				(PCM)/(ZB	PCM)/2(ZB	(PCM)/(ZB	(PCM/ZBC	9 (PCM)/46 (ZBC	27

(EDO239) Two weeks Community Connect internship (1.5 credits)

SEMESTER - 5

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE	COURSE TYPE (Core/Elective	L	T	P	O	NO. OF CONTACT	NO. OF CREDITS
CHH312-T	Transition Elements, Coordination Compounds and Chem	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH312-P	Transition Elements, Coordination Compounds and Chem				0	0	2	0		
PHH330-T	Basic Electronics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH330-P	Basic Electronics Lab				0	0	2	0		
EDH301-T	Plant Systematics and Angiosperm Phylogeny	EDU			3	0	0	0	5	

EDH301-P	Plant Systematics and Angiosperm Phylogeny Lab	EDU			0	0	2	0		
MAH350-T	Multivariate Calculus and Vector Calculus	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH350-P	Multivariate Calculus and Vector Calculus Lab				0	0	2	0		
EDH302-T	Ecology and Animal Behaviour	EDU			3	0	0	0	5	
EDH302	Ecology and Animal Behaviour Lab				0	0	2	0		
EDH303-T	Cell Biology and Genetics	EDU	HARD	CORE	3	0	0	0	5	4
EDH303-P	Cell Biology and Genetics Lab				0	0	2	0		
EDH214-T	Education in Contemporary India	EDU	HARD	CORE	3	0	0	0	5	4
EDH214-P	Education in Contemporary India Lab				0	0	2	0		
EDH109-T	Pedagogy of Biological Sciences	EDU	HARD	CORE ELECTIVE	3	0	0	0	5	4
EDH109-P	Pedagogy of Biological Sciences Lab				0	0	2	0		
EDH110-T	Pedagogy of Mathematics				3	0	0	0		
EDH110-P	Pedagogy of Mathematics Lab				0	0	2	0		
EDW304	Yoga & Health Education	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDN305	Colloquium	EDU	NTCC	CORE	0	0	0	0	0	2
EDO209	Phase I (Field Engagement)	EDU	OUTCOME	CORE	0	0	0	0	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				PCM)/18(ZBC	PCM)/1(ZBC	PCM)/15(ZBC)		31 (PCM)/34 (ZBC	25.5 (PCM)/29.5 (ZBC)

SEMESTER - 6

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE	COURSE TYPE (Core/Elective	L	T	P	O	NO. OF CONTACT	NO. OF CREDITS
CHH314-T	Electrochemistry and Photochemistry	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH314-P	Electrochemistry and Photochemistry Lab				0	0	2	0		
PHH331-T	Relativity and Quantum Mechanics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH331-P	Relativity and Quantum Mechanics Lab				0	0	2	0		
EDH310-T	Plant Physiology and Metabolism	EDU			3	0	0	0	5	
EDH310-P	Plant Physiology and Metabolism Lab				0	0	2	0		
MAH351-T	Group Theory	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH351-P	Group Theory Lab				0	0	2	0		
EDH311-T	Developmental Biology and Applied Zoology	EDU			3	0	0	0	5	
EDH311-P	Developmental Biology and Applied Zoology Lab				0	0	2	0		
PHH432-T	Atomic and Molecular Physics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH432-P	Atomic and Molecular Physics Lab				0	0	2	0		
EDH128-T	Pedagogy of Physical Sciences	EDU	HARD	CORE	3	0	0	0	5	4
EDH128-P	Pedagogy of Physical Sciences Lab				0	0	2	0		
EDW104	Reading And Reflection On Texts	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDO314	Phase-II Field Engagement	EDU	OUTCOME	CORE	0	0	0	2	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				PCM)/12(Z	PCM)/1(ZB	PCM)/11(Z	2	34(PCM)/26(ZBC)	23.5 (PCM)/19.5 (ZBC)

Career Development Centre Modules will be offered

SEMESTER - 7

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE	COURSE TYPE (Core/Elective	L	T	P	O	NO. OF CONTACT	NO. OF CREDITS
CHH315-T	Spectroscopy, Natural Products and Heterocyclics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH315-P	Spectroscopy, Natural Products and Heterocyclics Lab				0	0	2	0		

PHH433-T	Nuclear and Solid State Physics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH433-P	Nuclear and Solid State Physics Lab				0	0	2	0		
EDH410-T	Biochemistry , Plant Tissue culture and Biotechnology	EDU			3	0	0	0	5	
EDH410-P	Biochemistry , Plant Tissue culture and Biotechnology Lab				0	0	2	0		
MAH455-T	Numerical Analysis	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH455-P	Numerical Analysis Lab				0	0	2	0		
EDH411-T	Genetics and Palentology	EDU			3	0	0	0	5	
EDH411-P	Genetics and Palentology Lab				0	0	2	0		
MAH453-T	Linear Algebra	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH453-P	Linear Algebra Lab				0	0	2	0		
EDH402-T	Molecular Biology and Immunology	EDU			3	0	0	0		
EDH402-P	Molecular Biology and Immunology Lab				0	0	2	0	5	
EDN412	Seminar	EDU	NTCC	CORE	0	0	0	2	0	2
EDS236	School leadership and Management	EDU	SOFT	ELECTIVE	1	0	2	0	3	2
MOOC-21O-EDS-402	Educational Leadership									
EDS220	Peace and Value Education									
EDS221	Guidance and Counseling									
EDS222	Human Rights in Education									
EDS223	Environment and Education									
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				13	PCM)/ 1 (Z	10	2	27(PCM/24 (ZBC)	20

Career Development Centre Modules will be offered

SEMESTER - 8

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE	COURSE TYPE (Core/Elective	L	T	P	O	NO. OF CONTACT	NO. OF CREDITS
EDN403	Reflective Journal	EDU	NTCC	CORE	0	0	0	2	0	2
EDO404	Phase-III School Internship-Pedagogy-I	EDU	OUTCOME	CORE	0	0	0	8	0	8
EDO405	Phase-III School Internship-Pedagogy-II	EDU	OUTCOME	CORE	0	0	0	8	0	8
EDO415	Action Research	EDU	OUTCOME	CORE	0	0	0	2	0	2

EDO416	Case Study	EDU	OUTCOME	CORE	0	0	0	2	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				#REF!	#REF!	#REF!	22	#REF!	22

*COURSE NATURE	**Hard course (H)**: A course having L-T-P and/or O component ; L(Lecture), T(Tutorial), P(Practical) and O(Outcome)
	Soft Course (S): A course aimed at development of a person's emotional, social, ethical, professional and creative potentials. The course shall have L-P and/or O component
	Workshop course(W): A completely 'hands on' course conducted in Laboratory, aimed at developing application/ implementation/ designing skills of a person. The course shall have P component
	Non Teaching Credit Course(N): The course involves no teaching and has P and O component. Shall include projects, seminars, dissertations etc.

**OFFERING DEPARTMENT NAMES		A course shall be assigned credits as under:
EDU	DEPARTMENT OF EDUCATION	One credit for each lecture hour; One credit for each tutorial hour ; One credit for each Outcome hour; Two credits for each workshop/ Laboratory/practical/project session of 3 hours; One credit for each Laboratory or practical or project session of 2 hours
MRCFL	MANAV RACHNA CENTRE OF FOREIGN LANGUAGES	
CH	CHEMISTRY	
	MANAGEMENT	
CS	COMPUTER SCIENCE	

*** Electives are subject to change according to expertise avaiLable/ required.

PROGRAMME BOOKLET

Bachelor of Education (B.Sc. B.Ed.) (EDU02)

(Academic Session: 2018-2022)

Department of Education and Humanities
Manav Rachna University

MANAV RACHNA UNIVERSITY

Vision

To educate students in frontier areas of knowledge enabling them to take up challenges as ethical and responsible global citizens

Mission

- To impart outcome based holistic education
- To disseminate education in frontier areas
- To produce globally competitive, ethical and socially responsible human resources
- To produce human resources sensitive to issues of Environment and Sustainable Development
- To develop Environment and Sustainable development as a thrust area of research and development.

Quality Policy

To continuously learn from the best practices, study role models and develop transparent procedures for empowerment of stakeholders. **Strategic Objectives**

- To facilitate, enhance & promote innovation in curriculum design and delivery and have Outcome-oriented Learning Culture.
- To promote Research Environment and Management Practices.
- To enhance the quality of the student learning experience.
- To provide Resources and Infrastructure for Academic Excellence.

DEPARTMENT OF EDUCATION AND HUMANITIES

Vision

To nurture professionals in frontier areas of knowledge enabling them to take up challenges as ethical and responsible global citizens.

Mission

- To integrate contemporary pedagogies and skills in the teaching learning process.
- To formulate and transact research-based teacher education curriculum.
- To create a culture of grooming reflective practitioners.
- To demonstrate inclusion in deeds and action.

Bachelor of Education (B.Sc. B.Ed.) (EDU02)

Programme Educational Objectives (PEOs)

- To groom professional and humane teachers with key competencies pertinent to local and global scenario.
- To educate students to succeed in higher studies and thrust areas of research in the field of Education and other related fields.

Programme Outcomes (POs)

- Demonstrate core values: Commitment to profession; honour diversity and ensure inclusion; ethical integrity.
- Demonstrate competencies such as; Communication skills; working effectively with students and parents; drive for achieving improved student learning outcome.
- Demonstrate professional/technical knowledge of the physical, social and intellectual development of students.
- Demonstrate knowledge and understanding of: differentiating teaching to meet specific learning needs of students; both school education and teacher education-related subjects.
- Demonstrate knowledge required to design lesson plan learning sequences, implement teaching strategies using ICT, set explicit, challenging and achievable learning goals for all students.
- Demonstrate professional competencies/practice that are required to manage classroom activities by establishing and maintaining orderly and workable routines.
- Demonstrate professional competencies required to select, use and develop informal and formal, diagnostic, formative and summative assessment strategies to assess student learning, provide timely feedback to students, and participate in assessment moderation activities.
- Demonstrate competencies and actions required for keeping oneself professionally engaged independently and participate in learning to update knowledge and practice.

- Demonstrate the ability to conduct research in related thrust areas.
- Demonstrate an ability to connect with the community and provide solutions at educational, environmental, and social level.
- Demonstrate an attitude of reflection, social entrepreneurship and innovation.

PROGRAM SPECIFIC OUTCOMES

- Demonstrate the practical and theoretical understanding of core science courses: Botany/zoology/physics/chemistry/mathematics.
- Demonstrate an ability to develop inter and trans disciplinary approaches to connect with community and to provide solutions to emerging problems.
- Demonstrate bridging of the gap between academia, industry and society through field based projects and social engagements

Complete Programme Structure

DEPARTMENT OF EDUCATION

B.Sc. B.Ed. (2019-2023)

SEMESTER - 1										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/ Workshop/ NTCC)**	**COURSE TYPE (Core/ Elective / University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
CHH 135-T	**Atomic Structure and Bonding**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
CHH 135P	**Atomic Structure and Bonding Lab**				**0**	**0**	**2**	**0**		

PHH 121-T	Physics-I	APPLIED	HARD	CORE	3	1	0	0	6	4
PHH 121P	Physics-I Lab	SCIENCE			0	0	2	0		
EDH 113-T	Diversity of Microbes and Thallophytes	EDU			3	0	0	0	5	
EDH 113P	Diversity of Microbes and Thallophytes Lab				0	0	2	0		
MAH145-T	Differential Calculus and Analytical Geometry	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH145-P	Differential Calculus and Analytical Geometry Lab				0	0	2	0		
EDH 114-T	Animal Diversity-I	EDU			3	0	0	0	5	
EDH 114P	Animal Diversity-I Lab				0	0	2	0		

EDH 102-T	Foundation of Education	EDU	HARD	CORE	3	0	0	0	5	4
EDH 102P	Foundation of Education Lab				0	0	2	0		

MOOC18EEDS101/103	Developing of Soft Skills and Personality/Better Spoken English	EDU	MOOC	CORE	0	0	0	0	0	2
EDS 116	Communicative English- I		SOFT		1	0	2	0	3	
CSW 114 B	Critical Understanding of ICT in Education-I	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDO 144	Co Curricular Activities	EDU	NTCC	UNIVERSITY COMPULSORY	0	0	0	2	2	0.5

CHH 137	Environmental Science	CHH	NTCC	UNIVERSITY COMPULSORY	2	0	0	2	2	4
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				15	3(PCM)/1(ZBC)	11(PCM)/13(ZBC)	4	33(PCM)/ZBC	24 (PCM)/24(ZBC)

SEMESTER - 2

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)	COURSE TYPE (Core/ Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS
CHH13	States of Matter and Nuclear Chemistry	APPLIED	HARD	CORE	3	1	0	0	6	4

6-T		SCIENCE								
CHH136-P	States of Matter and Nuclear Chemistry Lab				0	0	2	0		
PHH122-T	Elasticity, Waves, Heat and Thermodynamics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH122-P	Elasticity, Waves, Heat and Thermodynamics Lab				0	0	2	0		
EDH132-T	Bryophytes and Pteridophytes	EDU			3	0	0	0	5	
EDH132-P	Bryophytes and Pteridophytes Lab				0	0	2	0		
MAH147-T	Partial Differentiations and Integral Calculus	APPLIED	HARD	CORE	3	1	0	0	6	4

MAH147-P	Partial Differentiations and Integral Calculus Lab	SCIENCE			0	0	2	0		
EDH131-T	Animal Diversity-II	Partial Differentiations and Integral Calculus+A28:B44			3	0	0	0	5	
EDH131-P	Animal Diversity-II Lab				0	0	2	0		
MAH146-T	Number Theory, Theory of Equations and Matrices	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH146-P	Number Theory, Theory of Equations and Matrices Lab				0	0	2	0		
EDH133-T	Learner and Learning Process	EDU	HARD	CORE	3	0	0	0	5	4

EDH 133 -P	Learner and Learning Process Lab				0	0	2	0		
EDS 103	Creating An Inclusive Classroom	EDU	SOFT	CORE	1	0	2	0	3	2
MO OC18EEDS -101	Better Spoken English	EDU	MOOC	CORE	0	0	0	2	0	2
MO OC19EEDS -101	Speaking Effectively									
EDS 134	Communicative English-II		SOFT	CORE	1	0	2	0	3	
CS W11 5B	Critical Understanding of ICT-II	CST	WORKSHOP	CORE	0	0	3	0	3	1.5
ED W12 5	Drama and Art Education	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
ED N13 6	Project Report on Field Trip	EDU	NTCC	UNIVERSIT	0	0	0	0	0	2

				Y COMPULSORY						
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				17(PCM)/14 (ZBC)	4(PCM)/1(ZBC)	20(PCM)/18 (ZBC)	2	43(PCM)/35 (ZBC)	29(PCM)/25 (ZBC)

POST SECOND SEMESTER SUMMER TRAINING (EDO165) (1.5 Credits)

SEMESTER - 3

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/Workshop/NTCC)	COURSE TYPE (Core/Elective/University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS
CHH 237-T	Organic Chemistry I	APPLIED SCIENC	HARD	CORE	3	1	0	0	6	4

CHH 237P	Organic Chemistry I Lab	E			0	0	2	0		
PHH 226-T	Electricity and Electromagnetism	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH 226P	Electricity and Electromagnetism Lab				0	0	2	0		
EDH 204-T	Gymnosperms and Reproduction in Angiosperms	EDU			3	0	0	0	5	
EDH 204P	Gymnosperms and Reproduction in Angiosperms Lab				0	0	2	0		
MAH248-T	Real Analysis	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH248-P	Real Analysis Lab				0	0	2	0		
EDH 205-T	Animal Diversity-III and Comparitive Anatomy of Vertebrates	EDU			3	0	0	0	5	

EDH 205P	Animal Diversity-III and Comparitive Anatomy of Vertebrates Lab				0	0	2	0		
EDH 221-T	Basics of Biophysics and Instrumentation	EDU	HARD	CORE	3	0	0	0	5	4
EDH 221P	Basics of Biophysics and Instrumentation Lab				0	0	2	0		
EDH 206-T	Knowledge and Curriculum	EDU	HARD	CORE	3	0	0	0	5	4
EDH 206P	Knowledge and Curriculum Lab				0	0	2	0		
EDS 207	Gender, school and society	EDU	SOFT	CORE	1	0	2	0	3	2
EDW 208	Craft and visual arts	EDU	WORKSHOP	CORE	0	0	3	0	3	2
FLS101	Spanish-I	MRCFL	ELECTIVE	UNIVERSITY COMPULSO	1	1	0	0	2	0
FLS102	German-I									

FLS103	French-I			RY						
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				17(PCM)/(ZBC)	4(PCM)/ 1 (ZBC)	15	0	36(PCM)/33 (ZBC)	24

SEMESTER - 4

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/Workshop/NTCC)	COURSE TYPE (Core/ Elective /University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS
CHH 238-T	Thermodynamics, Equilibrium and Solutions	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH 238P	Thermodynamics, Equilibrium and Solutions Lab				0	0	2	0		

CHH 313-T	Organic Chemistry II	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH 313P	Organic Chemistry II Lab				0	0	2	0		
PHH 227-T	Optics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH 227P	Optics Lab				0	0	2	0		
EDH 224-T	Angiosperm Anatomy; Ecology and Evolution	EDU			3	0	0	0	5	
EDH 224P	Angiosperm Anatomy; Ecology and Evolution Lab				0	0	2	0		
MAH 249 T	Differential Equation	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH 249 P	Differential Equation Lab				0	0	2	0		

EDH 225-T	Animal Physiology and Endocrinology	EDU			3	0	0	0	5	
EDH 225P	Animal Physiology and Endocrinology Lab				0	0	2	0		
EDH 122-T	Assessment For Learning	EDU	HARD	CORE	3	0	0	0	5	4
EDH 122P	Assessment For Learning Lab				0	0	2	0		
EDS 227	School Organization & Management	EDU	SOFT	CORE	1	0	2	0	3	2
EDW 228	e-learning	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
MOOC19E-EDS 202	Design Thinking- A Primer	EDU	MOOC	CORE	0	0	0	3	3	1.5
EDN 229	Street Play/ Skit/ Mime		Workshop	CORE	1	0	2	0		

MO OC19EEDS201	Principles of Human Resource Management	MGT	MOOC	CORE	0	0	0	3	3	2
MCS 231/ 232	Basics of Economics/ Introduction to Finance		SOFT	Elective	1	0	2	0		
FLS1 05	Spanish-II	MRCFL	ELECTIVE	UNIVERSITY COMPULSORY	1	1	0	0	2	0
FLS1 06	German-II									
FLS1 07	French-II									
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				19(PCM)/(ZBC)	5(PCM)/2(ZBC)	19(PCM)/(ZBC)	6(PCM/ZBC)	49 (PCM) /46 (ZBC)	27

(EDO239) Two weeks Community Connect internship (1.5 credits)

SEMESTER - 5

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/Workshop/NTCC)	COURSE TYPE (Core/Elective/University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS
CHH312-T	Transition Elements, Coordination Compounds and Chemical Kinetics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH312-P	Transition Elements, Coordination Compounds and Chemical Kinetics Lab				0	0	2	0		
PHH330-T	Basic Electronics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH330-P	Basic Electronics Lab				0	0	2	0		

EDH 301 -T	Plant Systematics and Angiosperm Phylogeny	EDU			3	0	0	0	5	
EDH 301 -P	Plant Systematics and Angiosperm Phylogeny Lab				0	0	2	0		
MA H35 0-T	Multivariate Calculus and Vector Calculus	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MA H35 0-P	Multivariate Calculus and Vector Calculus Lab				0	0	2	0		
EDH 302 -T	Ecology and Animal Behaviour	EDU			3	0	0	0	5	
EDH 302 -P	Ecology and Animal Behaviour Lab				0	0	2	0		
EDH 303 -T	Cell Biology and Genetics	EDU	HARD	CORE	3	0	0	0	5	4

EDH 303 -P	**Cell Biology and Genetics Lab**				**0**	**0**	**2**	**0**		
EDH 214 -T	**Education in Contemporary India**	**EDU**	**HARD**	**CORE**	**3**	**0**	**0**	**0**	**5**	**4**
EDH 214 -P	**Education in Contemporary India Lab**				**0**	**0**	**2**	**0**		
EDH 109 -T	**Pedagogy of Biological Sciences**	**EDU**	**HARD**	**CORE ELECTIVE**	**3**	**0**	**0**	**0**	**5**	**4**
EDH 109 -P	**Pedagogy of Biological Sciences Lab**				**0**	**0**	**2**	**0**		
EDH 110 -T	**Pedagogy of Mathematics**				**3**	**0**	**0**	**0**		
EDH 110 -P	**Pedagogy of Mathematics Lab**				**0**	**0**	**2**	**0**		

EDW304	Yoga & Health Education	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDN305	Colloquium	EDU	NTCC	CORE	0	0	0	0	0	2
EDO209	Phase I (Field Engagement)	EDU	OUTCOME	CORE	0	0	0	0	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				15(PCM)/18 (ZBC)	3(PCM)/1(ZBC)	13(PCM)/15 (ZBC)		31 (PCM) /34 (ZBC)	25.5 (PCM)/29.5 (ZBC)

SEMESTER - 6

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/Workshop/ NTCC)	COURSE TYPE (Core/ Elective /University Compulsory	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS

				)						
CH H314-T	Electrochemistry and Photochemistry	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CH H314-P	Electrochemistry and Photochemistry Lab				0	0	2	0		
PH H331-T	Relativity and Quantum Mechanics	APPLIED	HARD	CORE	3	1	0	0	6	4
PH H331-P	Relativity and Quantum Mechanics Lab	SCIENCE			0	0	2	0		

EDH 310 -T	Plant Physiology and Metabolism	EDU			3	0	0	0	5	
EDH 310 -P	Plant Physiology and Metabolism Lab				0	0	2	0		
MA H35 1-T	Group Theory	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MA H35 1-P	Group Theory Lab				0	0	2	0		
EDH 311 -T	Developmental Biology and Applied Zoology	EDU			3	0	0	0	5	
EDH 311 -P	Developmental Biology and Applied Zoology Lab				0	0	2	0		
PH H43 2-T	Atomic and Molecular Physics	APPLIED	HARD	CORE	3	1	0	0	6	4

PHH432-P	Atomic and Molecular Physics Lab	SCIENCE			0	0	2	0		
EDH128-T	Pedagogy of Physical Sciences	EDU	HARD	CORE	3	0	0	0	5	4
EDH128-P	Pedagogy of Physical Sciences Lab				0	0	2	0		
EDW104	Reading And Reflection on Texts	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDO314	Phase-II Field Engagement	EDU	OUTCOME	CORE	0	0	0	2	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				15(PCM)/12 (ZBC)	4(PCM)/1(ZBC)	13(PCM)/11 (ZBC)	2	34(PCM)/26 (ZBC)	23.5 (PCM)/19.5 (ZBC)
SEMESTER - 7										

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/Workshop/ NTCC)	COURSE TYPE (Core/ Elective /University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS
CHH315-T	Spectroscopy, Natural Products and Heterocyclics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH315-P	Spectroscopy, Natural Products and Heterocyclics Lab				0	0	2	0		
PHH433-T	Nuclear and Solid State Physics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH433-P	Nuclear and Solid State Physics Lab				0	0	2	0		

EDH 410 -T	Biochemistry , Plant Tissue culture and Biotechnology	EDU			3	0	0	0	5	
EDH 410 -P	Biochemistry , Plant Tissue culture and Biotechnology Lab				0	0	2	0		
MA	Numerical Analysis	APPLIED	HARD	CORE	3	1	0	0	6	4
H45 5-T		SCIENCE								
MA H45 5-P	Numerical Analysis Lab				0	0	2	0		
EDH 411 -T	Genetics and Palentology	EDU			3	0	0	0	5	
EDH 411 -P	Genetics and Palentology Lab				0	0	2	0		

MAH453-T	Linear Algebra	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH453-P	Linear Algebra Lab				0	0	2	0		
EDH402-T	Molecular Biology and Immunology	EDU			3	0	0	0		
EDH402-P	Molecular Biology and Immunology Lab				0	0	2	0	5	
EDN412	Seminar	EDU	NTCC	CORE	0	0	0	2	0	2
EDS236	School leadership and Management	EDU	SOFT	ELECTIVE	1	0	2	0	3	2

MOOC21O-EDS-401	Educational Leadership										
EDS 220	Peace and Value Education										
EDS 221	Guidance and Counseling										
EDS 222	Human Rights in Education										
EDS 223	Environment and Education										
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				13	4 (PCM) / 1 (ZBC)	10	2	27(PCM/24 (ZBC)	20	
SEMESTER - 8											

SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/Workshop/NTCC)	COURSE TYPE (Core/Elective/University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS
EDN403	Reflective Journal	EDU	NTCC	CORE	0	0	0	2	0	2
EDO404	Phase-III School InternshipPedagogy-I	EDU	OUTCOME	CORE	0	0	0	8	0	8
EDO405	Phase-III School InternshipPedagogy-II	EDU	OUTCOME	CORE	0	0	0	8	0	8
EDO415	Action Research	EDU	OUTCOME	CORE	0	0	0	2	0	2

ED O416	Case Study	EDU	OUTCOME	CORE	0	0	0	2	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				0	0	0	22	0	22

***COURSE NATURE**	**Hard course (H)**: A course having L-T-P and/or O component ; L(Lecture), T(Tutorial), P(Practical) and O(Outcome) **Soft Course (S):** A course aimed at development of a person's emotional, social, ethical, professional and creative potentials. The course shall have L-P and/or O component **Workshop course(W): A completely 'hands on' course conducted in Laboratory, aimed at developing application/ implementation/ designing skills of a person. The course shall have P component** **Non Teaching Credit Course(N):** The course involves no teaching and has P and O component. Shall include projects, seminars, dissertations etc.

Total Credit Scheme

S. No.	Semester	Contact Hours	Credits
1	I	33	24
2	II	43/35	29/25
3	Summer Training (Post II Sem)		1.5
4	III	36/33	24
5	IV	49/46	27
6	Community Connect (Post IV Sem)		1.5

7	V	31/34	25.5/29.5
8	VI	34/26	23.5/19.5
9	VII (School Internship)	27/24	20
10	VIII	0	22
Total			

Detailed Syllabus

SEMESTER - 1										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/Workshop/ NTCC)**	**COURSE TYPE (Core/Elective /University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
CHH135-T	**Atomic Structure and Bonding**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
CHH135-P	**Atomic Structure and Bonding Lab**				**0**	**0**	**2**	**0**		
PHH121-T	**Physics-I**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
PHH121-P	**Physics-I Lab**				**0**	**0**	**2**	**0**		
EDH113-T	**Diversity of Microbes and Thallophytes**	**EDU**			**3**	**0**	**0**	**0**	**5**	

EDH113-P	**Diversity of Microbes and Thallophytes Lab**				**0**	**0**	**2**	**0**		

MAH145-T	**Differential Calculus and Analytical Geometry**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
MAH145-P	**Differential Calculus and Analytical Geometry Lab**				**0**	**0**	**2**	**0**		
EDH114-T	**Animal Diversity-I**	**EDU**			**3**	**0**	**0**	**0**	**5**	
EDH114-P	**Animal Diversity-I Lab**				**0**	**0**	**2**	**0**		
EDH102-T	**Foundation of Education**	**EDU**	**HARD**	**CORE**	**3**	**0**	**0**	**0**	**5**	**4**
EDH102-P	**Foundation of Education Lab**				**0**	**0**	**2**	**0**		

MOOC-18E-EDS 101/103	Developing of Soft Skills and Personality/ Better Spoken English	EDU	MOOC	CORE	0	0	0	0	0	2
EDS116	Communicative English-I		SOFT		1	0	2	0	3	
CSW114B	Critical Understanding of ICT in Education-I	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDO144	Co Curricular Activities	EDU	NTCC	UNIVERSITY COMPULSORY	0	0	0	2	2	0.5
CHH137	Environmental Science	CHH	NTCC	UNIVERSITY COMPULSORY	2	0	0	2	2	4
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				15(PCM)/15(ZBC)	3(PCM)/ 1(ZBC)	11(PCM)/ 13(ZBC)	4(PCM/ ZBC)	33(PCM/ ZBC)	24 (PCM)/24(ZBC)

Course Title/Code	Atomic Structure & Bonding (CHH135-T)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	3-1-0-0	
Credits	3	
Course Objective	To develop an understanding of principles of atomic structure and Chemical Bonding.	
Course Outcomes (COs)		Mapping
CO1	Will be able to skilled in critical thinking and reasoning for different phenomenon related to structure of atom.	Skill Development
CO2	Will be able to use various periodic trends having a firm foundation in the fundamentals and application of current chemical and scientific theories.	Skill Development
CO3	Able to develop confidence for self-education and long learning w.r.t. properties of elements	Skill Development
CO4	Able to evaluate and solve chemical problems involving the features of chemical bonding.	Skill Development
CO5	Able to analyze concept and application of MOT and participate and succeed in competitive exams.	Skill Development
Prerequisites	Intermediate Chemistry	

SECTION A ATOMIC STRUCTURE

Discuss the processes on an atomic scale and show how the familiar concepts of classical mechanics have their basis in quantum theory. List the Characteristics of Black-body radiation, heat capacity of solids, Compton effect and explain how quantum theory accounts for them. Bohr's model of hydrogen atom and its limitations, significance of Ψ and Ψ^2, postulates of quantum mechanics, particle in one dimensional box. Radial wave functions, angular wave functions. Quantum numbers and their importance, atomic orbitals and shapes of s, p, d orbitals, multi-electron atoms, Aufbau and Pauli exclusion principles and Hund's multiplicity rule-Electronic configurations of the elements, effective nuclear charge. Slaters' rule, Energy level diagram for multi –electron atoms.

SECTION B

PERIODIC PROPERTIES AND S AND P-BLOCK ELEMENTS

Periodic table as an expression of regularity as a basis for organizing information. Atomic radius, Covalent, ionic and Vander waal radiiexplanation with examples. Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behavior. Factors influencing ionization energy in a group and a period. Electronegativity – Variation in a group and a period, Relationship between Electronegativity, Ionization Energy and Electron Affinity. Pauling Scale of Electronegativity.Comparative study of s-Block Elements, diagonal relationships, an introduction to alkyls and aryls –salient features of hydrides, Action of Liquid Ammonia, Properties of solutions of alkali metals in Liquid Ammonia, Anomalous properties of Lithium and Beryllium.
To appreciate the wide variety in Physical and Chemical characteristics of p-Block elements and their compounds. Comparative study (including diagonal relationships) of groups 13-17 elements, compounds like hydrides, oxides, oxyacid and halides of groups 13-16

SECTION C

CHEMICAL BONDING, I

Chemical bond as a basis for predicting the properties which should be expected for a given chemical substance. Ionic Solids – Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rule, valence bond and band theories. Weak interactions – Hydrogen bonding, van der Waals forces. Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICl_2, and H_2O.

SECTION D

MOLECULAR ORBITAL THEORY, BORANES AND XENON COMPOUNDS

Approaches to understand the properties and stabilities of molecules as viewed by different theories of bonding. Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M. O's by LCAO – H^{+}_{2} ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, σ^{*}, Π, Π^{*} orbitals and their characteristics. Hybrid orbitals – sp, sp^2, sp^3; calculation of coefficients of A.O.s used in these hybrid orbitals. Introduction to valence bond model of H_2, comparison of M.O. and V.B. 3
.Discussion about homonuclear (He_2, N_2, O_2, F_2, C_2) and heteronuclear (CO and NO) diatomic molecules, bond Order and bond energy, percentage ionic character from dipole moment and electronegativity difference.

References

University Chemistry: Bruce Mahan
Concise Inorganic Chemistry: J D Lee
An Introduction to Inorganic Chemistry: Mackay and Mackay

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	----	3	----	----	----	----	2	1	----	3	1	----
CO2	1	1	----	3	----	----	----	----	2	1	----	3	1	----
CO3	1	1	----	3	----	----	----	----	2	1	----	3	1	----
CO4	1	1	----	3	----	----	----	----	2	1	----	3	1	----
CO5	1	1	----	3	----	----	----	----	2	1	----	3	1	----

Course Title/Code	Atomic Structure & Bonding Lab (CHH135-P)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	0-0-2-0	
Credits	1	
Course Objective	To enable students to analyse water samples, perform acid-base titrations and learn concepts of organic synthesis along with their determination using some spectroscopic techniques.	
Course Outcomes (COs)		Mapping
CO1	Learn to run simulation experiment to understand the physical and chemical parameters determination for water	Employability
CO2	To develop understanding of Acid Base titration	Skill Development
CO3	To analyse the concept behind the formation of some organic compounds.	Skill Development
CO4	To familiarize students with various spectroscopic instruments, their principle and applications like UV-VIS, IR, NMR and fluorescence spectroscopy.	Employability
Prerequisites	Intermediate Chemistry	

TITRATIONS

1. Estimation of Sodium Carbonate and Sodium Bicarbonate in a mixture.

2. Estimation of Ammonia in Ammonium Salt by Back Titration.
3. Estimation of Ferrous ions using Potassium Permanganate
4. Estimation of Oxalic acid using Potassium Permanganate
5. Estimation of Ferrous ions Using Potassium Dichromate with Internal & External Indicators.
6. Standardisation of Sodium Thiosulphate using Potassium Dichromate and estimation of Iodine.
7. Estimation of Copper in a Copper salt by Iodimetry
8. Standardisation of EDTA solution using Zinc Sulphate and determination of Mg or Ca
9. Standardization of EDTA and estimating the hardness of water.
10. Determination of Alkali content of antacids.

Reference:

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	----	3	----	----	----	----	2	1	----	3	1	----
CO2	1	1	----	3	----	----	----	----	2	1	----	3	1	----
CO3	1	1	----	3	----	----	----	----	2	1	----	3	1	----
CO4	1	1	----	3	----	----	----	----	2	1	----	3	1	----

Course Title/Code	**Physics-I (PHH121-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**To enable students to understand Newtonian mechanics and apply Newton's laws to explain natural physical phenomena**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to understand, explain and demonstrate fundamentals of dynamics of a particle/system of particles and apply work and energy concepts to daily life problems**	**Skill Development**
CO2	**Students would be able to understand, analyse concept of collisions and hence would be able to evaluate and apply conservation laws on various physical systems**	**Skill Development**

CO3	**Students would be able to explain and analyse the concepts of central force motion and gravitation and hence apply them on planetary problems and solve and hypothesize problems related to central forces**	**Skill Development**
CO4	**Students would be able to explain and analyse rotational dynamics. They would also be able to formulate and construct a solution pertaining to it**	**Skill Development**
Prerequisites (if any)		

SECTION A

Particle dynamics, work and energy

Particle dynamics (review), Newton's First, Second and Third Law of Motion, Newton's I Law as a basic kinematical law defining a frame of reference, Newton's II Law as a basic dynamical law of mechanics and Newton's III law as an interaction law, Frames of reference, inertial and non-inertial, pseudo forces, Force laws, weight and mass, static procedure for measuring forces, Application of Newton's law, free body diagrams representing forces on the body and frictional forces. Discussion of importance of friction in daily life.

Work and Energy: Work done by a constant force and by a variable force–one- and two-dimensional cases. Kinetic energy and work-energy theorem and its Significance, the importance of language in Physics to be highlighted by differentiating the meaning of 'work', 'power', 'energy' as defined in Physics and in daily life.

SECTION B

Conservation Laws and collisions Conservation Laws: Introduction, conservative forces, potential energy, complete solution for one-, two- and three-dimensional systems, non-conservative forces, conservation of energy, conservation of energy to be seen as a spreading out and appearing in different forms, mass and energy.

Conservation of Linear Momentum: Centre of mass, motion of the center of mass, linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some applications of momentum principle, systems having variable mass – Rocket equation.

Collisions: Definition and types of collisions. Impulse and momentum, conservation of momentum during collisions, collision in one and two dimensions. Illustration with examples of collisions during accidents and collisions at atomic and sub-atomic level.

SECTION C

Gravitation and central forces

Gravitation*:* Historical Introduction, Newton's law of Universal Gravitation, inertial and gravitational mass, variation in acceleration due to gravity with altitude and depth, motion of planets and satellites, gravitational field and potential, gravitational potential energy, potential energy for many particle systems, calculations of field and potential for (a) a spherical shell, (b) a sphere, energy consideration in the motion of planets and satellites.

Central Force: Kepler's laws of planetary motion, the inverse square law, Derivation of Kepler's Law from Universal law of Gravitation.

SECTION D

Rotational Kinematics

Rotational variables, angular velocity, angular acceleration. Rotation with constant angular acceleration, Linear and angular variables, kinetic energy of rotation, rotational inertia, calculation of rotational inertia – of a rod, sphere and cylinder, torque, Newton's laws of rotation, work, power and work – kinetic energy theorem.

References

1. Fundamentals of Physics, 6th Edition, David Halliday, Robert Resnick and Jearl Walker, John Wiley and Sons Inc.
2. University Physics, Revised Edition, Harris Benson, John Wiley and Sons, Inc.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	3	2	----	1	2	2	3	----	1	1	1	-
CO2	1	2	3	2	----	1	2	2	3	----	1	1	1	-
CO3	1	2	3	2	----	1	2	2	3	----	1	3	3	-
CO4	1	2	3	2	----	1	2	2	3	----	1	1	1	-

Course Title/Code	**Physics-I(PHH121-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To provide training in the broad methodology of science through investigatory type and openended Laboratory exercises.**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to demonstrate an ability to conduct investigations of practical/technical issues consistent with their level of knowledge and understanding**	**Employability**
CO2	**Demonstrate an ability to analyse data and reach a valid conclusion.**	**Employability**

CO3	**Designing/performing/resolving the experiments to develop their individual capabilities and representing the collective team work.**	**Employability**
Prerequisites (if any)		

A minimum of TEN experiments out of the following:

1. Study of the rate of flow of water through a capillary tube under different pressure heads.
2. Study of the motion of an air bubble.
3. To study the relation between force and extension produced in a stretched spring.
4. To study the relation between length and time period of a simple pendulum.
5. Study of the motion of a freely falling body.
6. Study of the dependence of the period of oscillation of a spring-mass system on mass.
7. Study of the acceleration of a body subjected to different unbalanced forces.
8. Study of accelerations of different masses under a constant unbalanced force.
9. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
10. Study of conservation of momentum and energy of a collision in a plane.
11. Conservation of momentum in an explosion.
12. Study of the relation between pressure and volume of a gas at constant temperature.

References

1. PSSC Physics Laboratory Guide.
2. Practical Physics, E Armitage, John Murray.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3

CO1	3	-	-	3	-	3	3	-	-	3	-	-	2	-
CO2	3	-	-	3	-	3	3	-	-	3	-	1	-	-
CO3	3	-	-	3	-	3	3	-	-	3	-	-	2	-

Course Title/Code	**Diversity of Microbes and Thallophytes (EDH113-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-O Structure	**(3-0-0-0)**	
Credits	**3**	
Course Objective	**After going through this course, the learner will be able to develop an understanding of the diversity and classification of living organisms**	
Course Outcomes (COs)		**Mapping**

CO1	**Understand the basis and principles of classification of living organisms**	**Skill Development**
CO2	**Understand the diversity that exists in microorganisms**	**Skill Development**
CO3	**Understand the organization, morphological features and various modes of reproduction in Viruses, Bacteria, Algae and Fungi**	**Skill Development**
CO4	**Understand the structural diversity in Lichens and their ecological and economic importance**	**Employability**
CO5	**Understand the various role played by microorganisms in human welfare and would be able to identify some of the diseases caused by microorganisms and study their symptoms**	**Employability**
Prerequisites (if any)	**----------**	

SECTION A

Classification of living organisms Brief history, discovery, characteristics, structure, mode of nutrition, reproduction: Bacteriophages, Viruses, Prions (Special mention: Chronic Wasting Disease, Bovine

Spongiform Encephalopathy, Yellow Mosaic of Bean, Human Immunodeficiency Virus) Brief history, discovery, characteristics, structure, classification based on morphology and flagellation, mode of nutrition and reproduction: Bacteria, Mycoplasma, Cyanobacterium (Special mention: *Xanthomonascitri*, *Clostridium botulinum, Rickettsia, Sandal spike phytoplasma, Spirulina, Nostoc, Oscillatoria*)

SECTION B

Brief classification of Thallophytes General account, classification (Fritsch), occurrence, thallus organisation, reproduction and life cycle: Algae- Chlorophyceae (*Oedogonium, Chara*), Xanthophyte (*Vaucharia*), Phaeophyceae (*Sargassam*), Rhodophyceae (*Polysiphonia*), Bacillariophyceae (Pinnate diatoms)

SECTION C

General account, classification (Alexopoulos and Mims), occurrence, thallus organisation, reproduction and life cycle Fungi- Myxomycetes (*Stemonites*), Phycomycetes (*Albugo*), Ascomycetes (Yeast, *Penicillium*), Basidiomycetes (*Puccinia, Agaricus*), Deuteromycetes (*Cercospora, Collectotrichum*)

SECTION D

General account, distribution, types, structure, reproduction, ecological and economic importance: Lichens (Crustose, Foliose, Fruticose) ,Role of microorganisms in human welfare with respect to Environment, Agriculture, Pharmaceuticals and Industry.

References Books and Readings:

1. Alexopoulos.C.J. *Introductory Mycology.*

2. Chopra. *A Class book of Fungi*. Jullandar: S. Nagin& Co.
3. Dubey H.D. *A Text book of Fungi, Bacteria and Viruses.*
4. Kumar, H.D., *A Textbook of Algae.*
5. Pandey, B.P. *A Text book of Algae*. New Delhi: Sultanchand& Co.
6. Sharma, P.D. (2005). *The Fungi*. Meerut: Rastogi Publications.
7. Sharma, O.P. (1992). *Text book of Thallophytes*, New Delhi: TMH Publishing House.
8. Singh., Pande, P.C. &Jain, D.K. (2006). *A Text book of Botany*. Meerut: Rastogi Publications.
9. Singh., Pande, P.C. &Jain, D.K. (2007). *Diversity of Microbes and Cryptogams*. Meerut: Rastogi Publications.
10. Smith, G.M. (1971). *Cryptogamic Botany Vol.I, Algae & Fungi*. New Delhi: TMH Publishing Co.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	--	--	--	--	2	1	1	1	3	1	1
CO2	2	2	2	-----	---	----	---	2	1	1	1	3	1	2
CO3	2	1	2	-----	---	----	---	2	3	1	1	3	3	2
CO4	2	1	2	-----	---	----	---	2	3	1	1	3	1	2
CO5	2	1	2	-----	---	----	---	2	3	2	2	3	3	3

Course Title/Code	**Diversity of Microbes and Thallophytes Lab (EDH113-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**(0-0-2-0)**	
Credits	**1**	
Course Objective	**To develop the skill of preparing bacterial cultures and identifying diseases caused by microorganisms based on their symptoms.**	
Course Outcomes (COs)		**Mapping**
CO1	**To enable students to develop the skills of staining and mounting microbes.**	**Skill Development**
CO2	**To enable students to develop the skill of preparing bacterial cultures**	**Employability**
CO3	**To develop in the students skill of identifying diseases caused by microorganisms based on their symptoms.**	**Employability/ Skill development**
CO4	**To develop the skill of observing and identifying microbes using temporary and permanent slides.**	**Employability /Skill Development**

Prerequisites (If any)	**------**

Lab Experiments

- Observation of disease symptoms in hosts infected by virus, mycoplasma and bacteria.
- Gram staining of bacteria.
- Preparation of bacterial media and culture of bacteria.
- Study of genera included in theory under Cyanobacteria, algae and fungi by making temporary micropreparations and using permanent slides.
- Study of crustose, foliose and fruticose lichens.

REFERENCES

1. Alexopoulos.C.J. *Introductory Mycology.*
2. Chopra. *A Class book of Fungi*. Jullandar: S. Nagin& Co.
3. Dubey H.D. *A Text book of Fungi, Bacteria and Viruses.*
4. Kumar, H.D., *A Textbook of Algae.*

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	-	-	2	1	-	-	-	-	3	--	3
CO2	1	1	2	-	-	-	2	-	-	--	-	3	-	3
CO3	1	-	2	--	-	2	1	-	-	-	-	3	-	3
CO4	-	2	3	--	--	1	2	--	-	3	-	1	-	-

Course Title/Code	**Differential Calculus and Analytical Geometry (MAH145-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-1-0-0**
Credits	**3**
Course Objective	**To enable students to develop understanding of differentiability theorems and their applications.**

Course Outcomes (COs)		**Mapping**
CO1	**Understand & apply the concept of application derivatives to find solution of related Problems**	**Skill Development**
CO2	**Explain and solve problem based on differentiability theorems and their applications**	**Skill Development**
CO3	**Apply the knowledge of properties of conics to characterize different types of conics**	**Skill Development**

CO4	**Explain & analyse different types of confocal conics & polar equation of conics**	**Skill Development**
Prerequisites (if any)	**N. A**	

SECTION A

Continuity and Differentiation - I

Limits, one-sided limits, Infinite limits and limits at infinity, Continuous functions, Discontinuous functions, Continuity theorems, Uniform continuity.Differentiation, Linear approximation theorem, Higher derivatives, Leibnitz's theorem.Monotone functions, Maxima and Minima, Concavity, Convexity and Points of inflection.

SECTION B

Differentiation - II

Polar coordinates, angle between the radius vector and the tangent at a point on a curve, angle of intersection between two curves.Differentiability theorems, Rolle's theorem, Lagrange's Mean Value theorem, Cauchy's Mean Value Theorem, Taylor's theorem, Maclaurin's theorem, Generalised Mean Value theorem, Taylor's Infinite series and power series expansions, Maclaurin's infinite series, Indeterminate forms.

SECTION C

Analytical Geometry – I

Cartesian coordinates in three dimensional spaces, Relation between Cartesian coordinates and position vector, Distance formula (Cartesian and Vector form), Direction cosines, Direction ratios, Projection on a Straight line, angle between two lines, Area of Triangle, Volume of a tetrahedron. Straight line, equations and straight lines (Cartesian and Vector form.

SECTION D

Analytical Geometry – II

Planes, Equations of Planes (Cartesian and Vector form), Normal form, Angle between planes, Coaxial planes, Parallel and Perpendicular planes, Length of a Perpendicular from a point to a plane, Bisectors of angles between two planes, Mutual, Position of lines and planes, shortest distance between two skew lines.

Translation and Rotation of Cartesian axes in plane, Curves of second degree, Discriminant and Trace, Theorem on Discriminant and trace, Generalization of second degree in two variables represents either empty set or a point or a line or a pair of lines or a parabola or an ellipse or a hyperbola.

References:

1. Calculus by Anton, Addison-Wiley.
2. Calculus with Analytical Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry, Thomas and Finney, S. Chand and Co. Ltd.
4. First Course in Calculus, Serge Lang, Addison-Wiley
5. Calculus by Lipman Bers, Vols. 1 and 2, IBH.
6. Advanced Calculus, Frank Ayres, Schaum Publishing Co.
7. Higher Algebra by Bamard and Child, MacMillan India Ltd.
8. Integral Calculus by Shanthinarayan, S. Chand and Co.Ltd.
9. Differential Calculus by Gorakhprasad, Pothishala Ltd.
10. Elements of Analytical Solid Geometry by Shanthinarayan
11. Calculus and Analytical Geometry by Thomas – Finney, Narosa Publishing House.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	----	3	2	3	2	----	----	----	----	----	1	2
CO2	2	3	----	2	2	2	1	----	----	----	----	----	2	2
CO3	1	2	----	2	2	1	3	----	----	----	----	----	1	1
CO4	1	1	----	2	2	2	2	----	----	----	----	----	1	1

Course Title/Code	**Differential Calculus and Analytical Geometry Lab (MAH145-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To develop the practical skills to apply the concept of application derivatives to find solution of related Problems**	
Course Outcomes (COs)		**Mapping**
CO1	**Understand & apply the concept of application derivatives to find solution of related Problems**	**Skill Development**
CO2	**Explain and solve problem based on differentiability theorems and their applications**	**Skill Development**
Prerequisites (if any)	**N. A**	

1) Introduction to Octave /Matlab
2) Introduction to Graphs (2D graphs)
3) Introduction to Graphs (3D graphs)
4) Differential Calculus using Octave
5) Differential Calculus: Eulers Theorem & derivative of Composite Function
6) To get the condition for general equation to represent a pair of lines
7) To get the condition for general equation to represent parabola, Ellipse & Hyperbola
8) Area of triangle, Volume of tetrahedral
9) Length of the perpendicular from a point to the plane.
10) To find the angle between pair of lines represented by generalized second degree equations

Reference Books:

1. Calculus by Anton, Addison-Wiley.
2. Calculus with Analytical Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry, Thomas and Finney, S. Chand and Co. Ltd. 4. First Course in Calculus, Serge Lang, Addison-Wiley

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	----	3	2	3	2	----	----	----	----	----	1	2
CO2	2	3	----	2	2	2	1	----	----	----	----	----	2	2

Course Title/Code	**Animal Diversity-I (EDH114-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**To enable students to understand invertebrates, the organizational hierarchies and complexities; the evolutionary trends in external morphology and internal structure; identification and classification with examples; to enable them to understand various modes of adaptations in animals.**	
Course Outcomes (COs)		**Mapping**
CO1	**Explain the basis and principles of classification of living organisms**	**Skill Development**
CO2	**Evaluate and understand the diversity that exists in Protozoa and Porifera**	**Skill Development**

CO3	**Remember the organization, morphological features and various modes of reproduction in Cnidaria and Acnidaria**	**Employability**
CO4	**Explain the morphology and various mode of reproduction in Helminthes.**	**Skill Development**
CO5	**Able to identify some of the diseases caused by Helminthes and study their symptoms**	**Entrepreneurship & Skill Development**
CO6	**Analyse and understand the diversity of phylum Annelida**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of animal kingdom**	

SECTION A

ANIMAL CLASSIFICATION, PROTOZOA AND PORIFERA

a) Principles of classification: Binomial nomenclature and outline classification of animal kingdom.
b) Protozoa: General characters and classification of Phylum Protozoa up to orders with examples; Type study: Plasmodium– External morphology, lifecycle and pathogenicity; Nutrition in Protozoa – Holozoic, holophytic, saprozoic and parasitic nutrition; Locomotion in Protozoa – Locomotor organelles and types of movement; Reproduction in Protozoa: Asexual – fission, budding, sporulation; Sexual – conjugation (amphimixis), syngamy and autogamy.
c) Porifera: General characters affinities and classification of Phylum Porifera up to orders with examples; Type study: Sycon – External morphology and cellular organization; Skeletal system in sponges; Canal system – Ascon, sycon and leucon types; Reproduction in sponges: Budding and gemmule formation, lifecycle with reference to Amphiblastula and Parenchymal larvae.

SECTION B CNIDARIA AND ACNIDARIA

a) Cnidaria: General characters and classification of Phylum Cnidaria up to orders with examples; Type study: Obelia– External morphology, metagenesis and lifecycle Mesenteries in Metridium; Polymorphism in Cnidaria; Corals and coral reefs, their types, formation, theories and importance.
b) Acnidaria (Ctenophora): General characters and classification of Phylum Acnidaria up to orders with examples; Type study – Pleurobrachia, Affinities of Acnidaria.

SECTION C

HELMINTHES – PLATYHELMINTHES AND NEMATHELMINTHES

a) Platyhelminthes: General characters and classification of Phylum Platyhelminthes up to orders with examples; Type study: Fasciola hepatica– External morphology, digestive system, excretory system and reproductive system – asexual, sexual and regeneration.
b) Nemathelminths: General characters and classification of Phylum Nemathelminths up to orders with examples; Type study: Ascaris– External morphology, digestive system, excretory system, reproductive system and life-cycle.
c) Mode of infection and pathogenicity of i) Fasciola hepatica, ii) Taeniasolium, iii) Ancylostomaduodenale, iv) Trichinellaspirallis (2); Host parasite relationship and parasitic adaptation in Helminthes

SECTION D ANNELIDA

General characters and classification of Phylum Annelida up to orders with examples; Type study: Pheretima– External morphology, coelom, locomotion, digestive system, blood vascular system, excretory system, reproductive system, life-history and regeneration; Comparative study of a) digestive system, b) coelom duct and nephridia in Pheretima, Nereis and Hirudinaria); Trochophore larva; metamerism in Annelida.

References Books and Readings:

1. Modern Textbook of Zoology Invertebrates by R.L. Kotpal – (Rastogi Publications, Meerut, 10th Revised Edition).
2. Invertebrate Zoology series (Protozoa to Echinodermata) by R.L. Kotpal – (Rastogi Publications, Meerut).
3. Invertebrate Zoology by E.L. Jordon and P.S. Verma – S. Chand & Co., Delhi).
4. Invertebrate Zoology by J.K. Dhami and P.S. Dhami – S. Chand & Co., Delhi).
5. A Textbook of Invertebrate Zoology by S.N. Prasad – (Kitab Mahal, Allahabad).

6. Life of Invertebrates by Russel and Hunter – (Macmillan)
7. The invertebrate series of L.H. Hyman – (McGraw Hill)
8. A student's textbook of Zoology by Adam Sedgwick Vol. I, II & III – (Central Book Depot, Allahabad).
9. A Text book of Zoology vol.1 by Parkar and Haswell – (Macmillan)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
CO2	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
CO3	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
CO4	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
CO5	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
CO6	2	1	2	-	-	-------	-	2	1	1	1	3	1	1

Course Title/Code	**ANIMAL DIVERSITY -I Lab (EDH114-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**0-0-2-0**
Credits	**1**

Course Objective	**To develop in students the skills; of staining and mounting of materials (temporary and permanent); of dissection, display and Labelling; of preparation of cultures of invertebrates by using common culture methods; of Laboratory observation of animals**	
Course Outcomes (COs)		**Mapping**
CO1	**To familiarize the students with the basic knowledge and working of microscope**	**Skill Development**
CO2	**To develop in the students the ability to spot the specimens of various organisms belonging to different phyla**	**Skill Development**
CO3	**To study the permanent slides of the lower invertebrate phyla**	**Skill Development**
CO4	**To prepare the temporary mount slides of amoeba and paramecium**	**Skill Development & Employability**
Prerequisites (if any)	**-----**	

1. Study of microscopes: Simple and compound, handling of microscopes.
2. Study of permanent slides of Protozoa, Amoeba, Entamoeba, Euglena, Paramecium, Giardia and Plasmodium
3. Study of specimens and permanent slides of Porifera: Sycon, Spongilla, Euplectella, Sponge spicules of various types and Spongin fibres. Sponge gemmule h) T.S. Sycon i) L.S. of Sycon.
4. Preparation of permanent and stained slides: a) Sponge spicules b) Sponge gemmules.
5. Study of specimens of Cnidaria: Physalis, Porpita, Valella, Pennatula, Alcyonium , Madrepora, Meandrina, Astreaj and Gorgonia.
6. Study of permanent slides of Cnidaria: Hydra, Obelia colony, Obelia medusa, Tubulariae, Pennaria, Metridium (T.S. of Meridiam) Aurelia, Ephyra larva.
7. Preparation of permanent and stained slide of Obeliacolony.

8. Study of specimens of Helminthes: Dugesiab) Fasciolac)Taeniasoliumd)Ascarise)Enterobiusf) Ancylostomag) Trichinella.
9. Study of permanent slides of Helminthes- a) Cercaria of fasciola b) Redia of Fasciola c) Miracidium of Fasciola.
10. Dissection of Pheretima (Study of dissected specimens) a) Digestive system b) Nervous system c) Reproductive system.
11. Study of specimens of Annelida: a) Pheretimab) Nereis) Heteronereisd) Hirudinariae) Aphroditef) Sipunculus
12. Study of permanent slides of Annelida: a) T.S. of Pheretima b) T.S. of Nereis c) T.S. of Hirudinaria d) Parapodium of Nereis. E) trochophore larva of leech.
13. Preparation of permanent and stained slides: *a) Nereis*parapodia b) Jaws of Leech c) Nephridia of Leech

Field Visit- Any national park/ sanctuary/ biosphere reserve / botanical garden.

References Books and Readings:

1. Modern Textbook of Zoology Invertebrates by R.L. Kotpal – (Rastogi Publications, Meerut, 10th Revised Edition).
2. Invertebrate Zoology series (Protozoa to Echinodermata) by R.L. Kotpal – (Rastogi Publications, Meerut).
3. Invertebrate Zoology by E.L. Jordon and P.S. Verma – S. Chand & Co., Delhi).
4. Invertebrate Zoology by J.K. Dhami and P.S. Dhami – S. Chand & Co., Delhi).

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	-	-	2	1	-	-	-	-	1	--	--
CO2	1	1	2	-	-	-	2	-	-	--	-	1	-	-
CO3	1	-	2	--	-	2	1	-	-	-	-	1	-	-
CO4	-	2	3	--	--	1	2	--	-	-	-	1	-	-

Course Title/Code	**Foundations of Education (EDH102-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-0-0-0**
Credits	**3**
Course Objective	**To orient the students about the philosophical and sociological foundation of Education**

Course Outcomes (COs)		**Mapping**
CO1	**Assimilate the concept of Education and Its philosophical aspects**	**Employability**
CO2	**Comprehend the Socio-Cultural aspect of Education**	**Employability**
CO3	**Discuss the Inter-disciplinary nature of Education**	**Skill Development**
CO4	**Analyse the contribution of various Indian and western Educationists to Indian Education System**	**Entrepreneurship**

CO5	**Reflect on the Educational concerns and Issues in the Indian context**	**Entrepreneurship**
Prerequisites (if any)	**NA**	

SECTION A

BASICS OF EDUCATION AND PHILOSOPHY

Education: Concept, meaning, aims and functions of education, Critical understanding of various related terms: Training, Instruction, Teaching and Indoctrination, Education as a discipline and its interdisciplinary nature, Role of Education in promotion of Culture and value inculcation. Introduction to philosophy with special reference to its branches, Relation between Education and Philosophy, Nature and Scope of Educational Philosophy

SECTION B EDUCATIONAL THOUGHTS AND THEIR IMPLICATIONS

Contribution of following thinkers with respect to meaning of education, aims, curriculum development and techniques of maintaining discipline in present scenario. Indian Educationists: Mahatma Gandhi, Rabindranath Tagore, Swami Vivekananda, Jiddu Krishnamurthy and Dr. B.R Ambedkar. Western Educationists: Plato, Rousseau, John Dewey, and Paulo Freire

SECTION C EDUCATION AND SOCIETY

Relation between Education and Society, Education as an agent of Social Change, Education and Culture, Socio-cultural influences of Globalization on Education, Socialization of child and social agencies of education, Constitutional values and Education

SECTION D NATIONAL CONCERNS IN EDUCATION

Equalization of Education Opportunities- Accessibility, Affordability and Equality to all. Constitutional Provisions for ensuring equity and equality in Education-with special reference to Right to Education (RTE). Education and Gender Equality, Nature of Democracy and its implications, Secularism and Religious Pluralism, National and Emotional Integration in Indian context.

Reference Book and Readings

1. Anand, C L and et al (1993). *Teacher and Education in the Emerging Indian Society*. New Delhi: NCERT.
2. Bhatia, K. & Bhatia, B. (1974) *The Philosophical and Sociological Foundations of Education*. Delhi: Doaba House.
3. Delors, Jacques (1996). *Learning the Treasure Within*. Report to UNESCO of the International Commission on Education for the Twenty-first Century. UNESCO.
4. Dewey J (1966). *Democracy in Education*, New York: Macmillan.
5. Gandhi M K (1956). *Basic Education*. Ahmedabad, Navajivan.
6. Goel, A. & Goel S.L. (2005). *Human values and Education*. New Delhi: Deep and Deep Publications Pvt. Ltd.
7. Govt. of India (1952). *Report of the Secondary Education Commission*. New Delhi.
1. Govt. of India. MHRD (1986, Revised 1992) *National Policy of Education*, New Delhi.
2. NCERT (2014*). Basics of Education*. NCERT: Publication Division.
3. R. S. Peters (Ed.) (1967) *The concept of education*. London: Routledge & Kegan Paul.
4. Rajput, J.S. (2006). *Human Values and Education*. New Delhi: Pragun Publications.
5. Saraswathi T S (1999). *Culture, Socialization and Human Development*. Sage Publication.
6. Sharma, A. P. (2010). *Indian and Western Educational Philosophy*. New Delhi: Unicorn Books.
7. Walia, J.S. (2011). *Philosophical, Sociological and Economic Bases of Education.*
8. Jalandhar: Ahim Paul Publishers.

	PO1	PO2	PO3	PO4	PO5		PO7		PO9	PO10	PO11			
CO						PO6		PO8				PSO1	PSO2	PSO3

CO1	---	---	2	3	---	2	----	2	3	3	3	---	3	---
CO2	3	1	2	3	---	3	----	2	3	3	1	---	1	1
CO3	3	3	3	----	---	3	----	2	3	3	---	---	---	3
CO4	2	----	1	2	3	3	----	2	3	3	3	---	2	2
CO5	1	----	2	3	---	3	---	2	3	2	3	---	1	2

Course Title/Code	**Foundations of Education Lab (EDH102-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To orient the students about the philosophical and sociological foundation of Education**	
Course Outcomes (COs)		**Mapping**
CO1	**Apply the philosophical understanding of Education into the real classroom situation**	**Employability**
CO2	**Reflect upon the Socio-Cultural aspect of Education through practical activities**	**Employability**
CO3	**Appreciate the contribution of various Indian and western Educationists in shaping the Indian Education System with reference to the present scenario**	**Entrepreneurship**
Prerequisites (if any)	**NA**	

1. Report writing based on visits made to schools practicing innovative philosophies in areas of education like inclusive education, gender sensitization, secularism and any other crucial area.
2. A Survey regarding ground realities of implementation of the provisions of RTE in any one school in the neighborhood.
3. Group discussions on any suitable topics concerning contemporary society like aggression among youth, misuse of democracy, implications of secularism etc. and to reflect upon different viewpoints.
4. Organization of and participation in street plays /dramas/ declamation/ debates/ any other suitable activity on any theme of Philosophical perspectives of Socio-Political scenario in India.
5. Preparation of quotation boards to display quotes of great philosophers in the college premises.
6. Any other suitable activity

Reference Book and Readings

1. Govt. of India. MHRD (1986, Revised 1992) *National Policy of Education*, New Delhi.
2. NCERT (2014*). Basics of Education*. NCERT: Publication Division.
3. R. S. Peters (Ed.) (1967) *The concept of education*. London: Routledge & Kegan Paul.
4. Rajput, J.S. (2006). *Human Values and Education*. New Delhi: Pragun Publications.
5. Saraswathi T S (1999). *Culture, Socialization and Human Development*. Sage Publication.
6. Sharma, A. P. (2010). *Indian and Western Educational Philosophy*. New Delhi: Unicorn Books.
7. Walia, J.S. (2011). *Philosophical, Sociological and Economic Bases of Education.*Jalandhar: Ahim Paul Publishers.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	------	------	2	3	--------	2	----	2	3	3	3	-	2	-
CO2	3	1	2	3	--------	3	----	2	3	3	1	-	3	2
CO3	2	----	1	2	3	3	----	2	3	3	3	-	--	1

Course Title/Code	Developing Soft Skills and Personality/Better Spoken English (MOOC-18E-EDS-101/103)	
Course Type	Core	
Course Nature	MOOC	
L-T-P-0 Structure	(0-0-0-0)	
Credits	2	
Objective	The course aims to cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality	
Course Outcomes	Course Mapping	
CO1	To encourage the all-round development of students by focusing on soft skills.	Skill Development
CO2	To become more effective individual through goal/target setting, self-motivation and practicing creative thinking.	Entrepreneurship
CO3	To expose students to right attitudinal and behavioral aspects and to build the same through activities	Skill Development

SECTION A

Introduction: A New Approach to Learning, Planning and Goal-Setting, Human Perceptions: Understanding People, Types of Soft Skills: Self-Management Skills, Aiming for Excellence: Developing Potential and Self-Actualisation, Need Achievement and Spiritual Intelligence. Conflict Resolution Skills: Seeking Win-Win Solution, Inter-Personal Conflicts: Two Examples, Two Solutions, Types of Conflicts: Becoming A Conflict Resolution Expert, Types of Stress: Self-Awareness About Stress, Regulating Stress: Making The Best out of Stress.

SECTION B

Habits: Guiding Principles, Identifying Good and Bad Habits, Habit Cycle; Breaking Bad Habits, Using the Zeigarnik Effect for Productivity and Personal Growth, Forming Habits of Success. Communication: Significance of Listening, Active Listening, Barriers to Active Listening; Telephone Communication: Basic Telephone Skills, Advanced Telephone Skills, Essential Telephone Skills.

SECTION C

Technology and Communication: Technological Personality? Mobile Personality, E-Mail Principles, How Not to Send E-Mails, Netiquette, E-Mail Etiquette. Communication Skills: Effective Communication, Arising out Of Sender/Receiver's Personality; Barriers to Communication: Interpersonal Transactions, Miscommunication; Non-Verbal Communication: Pre-Thinking Assessment-1 & 2.

SECTION D

Nonverbal Communication: Introduction and Importance, Issues and Types, Basics and Universals, Interpreting Non-Verbal Cues; Body Language: For Interviews, For Group Discussions.Presentation Skills: Overcoming Fear, Becoming A Professional, The Role of Body Language, Using Visuals, Reading Skills: Effective Reading, Human Relations: Developing Trust and Integrity.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	2	1	-----	-----	2	3	3	3	2	-	2	-
CO2	1	1	2	1	------	-----	1	3	3	3	1	-	3	2
CO3	2	1	2	2	3	-------	2	3	3	3	-----	-	--	1

Course Title/Code	**Communicative English-I (EDS116)**
Course Nature	**Soft**
Course Type	**Core**
L-T-P-0 Structure	**1-0-2-0**
Credits	**2**

Course Objective	The Course aims at developing communication skills among learners	
Course Outcomes (COs)		Mapping
CO1	Demonstrate accuracy in the usage of grammar in their communication	Employability /Skill
CO2	Showcase skills while communicating verbally	Skill Development
CO3	Display proficiency while using morphology and syntax of English language	Entrepreneurship/Skill
CO4	Express themselves accurately in writing	Skill development
CO5	Use different techniques while reading for comprehension	Skill development
Prerequisites (if any)		

SECTION A GRAMMAR

GRAMMAR AND USAGE –, Parts of Speech, Sentence (Declarative, Affirmative, Negative, and Interrogative, Simple), concept of Clause and Phrase, Transformation of sentences.
Word order and concord, Verbs (Finite, Nonfinite, linking verbs, auxiliary verbs, modals,) Tenses Some common errors in English.

SECTION B

ORAL COMMUNICATION
Features of oral communication- word stress-intonation- falling and rising tones.
CONVERSATIONS: Introducing yourself, Body Language, Public speaking, Debates, Group Discussion Skills, Interview skills and Etiquette, Meetings, Voice and delivery, Dress code, Class seminar presentation

SECTION C

READING COMPREHENSION

COMPREHENSION SKILLS: Reasons for Poor Comprehension, Techniques for Good Comprehension (Skimming and Scanning), Non-verbal signals, Structure of the text, Author's Viewpoint, Reader's Anticipation, Summarizing

SECTION D ACADEMIC WRITING

NOTE MAKING: Methods of preparing notes.

PRÉCIS: Summary, Abstract, Synopsis,

LETTER: Letter structure and element, types of letters (Application, Cover, Acknowledgement, Recommendation, Appreciation, Acceptance, Apology, Complaint, Inquiry, Order)

Reference Books and Readings:

1. Cholis, M. (2007). *Towards Academic English. New* Delhi: Cambridge University Press
2. Cohen, F. R. & Miller L. J. (2003). *Reasons to Write: Strategies for Success in Academic Writing.* New York: Oxford University Press.
3. Kohli, A. L. (1993). *English Grammar*, *Reading and Writing Skills.* Chandigarh: Kohli Publishers
4. Kumar, S. & Lata, P. (2012). *Communication Skill in English*. New Delhi: Oxford University Press.
5. Mohan, K. & Banerji, M. (1990). *Developing Communication Skills*. New Delhi: MacMillan India Ltd.
6. Washburn, P. (2010). *The Vocabulary of Critical Thinking.* New York: OUP.
7. Eastwood, J. (1999). *Oxford Practice Grammar.* India: Oxford University Press.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	----	1	1	2	3	1	----	2	----	3	3	--	--	--
CO2	----	1	1	3	3	1	2	1	3	3	---	--	1	2
CO3	----	1	2	3	2	1	2	1	3	3	---	--	2	2
CO4	----	1	2	3	2	1	2	1	3	3	---	--	2	2
CO5	----	1	2	3	2	1	2	1	3	3	---	--	1	2

Course Title/Code	Critical Understanding of ICT in Education-I (CSW114B)	
Course Type	Workshop	
Course Nature	Soft	
L-T-P-0 Structure	(0-0-3-0)	
Credits	1.5	
Objective	To assist students in developing the fundamental information and skills they need to function successfully in their daily lives.	
Course Outcomes	Course Mapping	
CO1	To demonstrate the understanding of the main components of the computer hardware and software in use.	Entrepreneurship
CO2	To integrate technology tools for teaching learning and material development	Entrepreneurship
CO3	To integrate use of ICT to simplify record keeping, information management in education administration.	Employability
CO4	To implement various ICTs for project / problem-based constructivist learning environments.	Entrepreneurship

Section A

Introduction to Computer Systems Characteristics and Components of a computer system, Memory – Primary & Secondary, Input Devices, Output Devices, Hardware and Software

Operating System Microsoft Windows - Versions of Windows, Basic Windows elements, Folder and File management, using essential accessories: Calculator, Notepad, Paint, WordPad. Utility of My Computer, My Documents, recycle bin, My Network Places, Control Panel, Searching Files

SECTION B

Introduction to Internet

Introduction to internet, www, urls, portals, web browsers, ip addresses, searching and downloading content, e-mail, intranet.

SECTION C

Word Processing :Creating and handling documents, Editing, Spellcheck, Formatting, Tables, Macros, Mail merge, Page setting, Headers and footers, Printing documents

Spreadsheet Package :Creating and handling workbook and spreadsheet, Editing, Formatting, Cell referencing, Formulae and Functions, Charts and Graphs, Macros, Views, Sorting, Page setting, Headers and footers, Printing worksheets

SECTION D

Presentation Package :Creating and handling presentations, Using templates, Views, Handling Master slide - Notes and Handouts, Slide Design and layout, Animations, Transition, Slide Show, Custom Show, Timing, Headers and footers, Printing Presentations and handouts.

Reference Books and Readings

1. Bharihok, D. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi.

2. Jain Amit; Sharma Samart; & Banerji Saurab (2002). Microsoft PowerPoint. NISCOM, CSIR: New Delhi.

3. Lee, William w., Dianna, L. Owens, (2001) Multimedia based Instructional Design: Computer based training. Jossey-Bass

4. Mishra, S. (Ed.) (2009). STRIDE handbook 08: E-learning. IGNOU: New Delhi.

5. National Policy on ICT in Education. (2010). New Delhi: Department of School Education and Literacy. Ministry of HRD, GOI, Retrieved from: http://mhrd.gov.in/ict_school

6. Roblyer, M.D. (2008). *Integrating Educational Technology into Teaching*. New Delhi: Pearson Education, South Asia, India.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	-	3	2	3	2	-	3	-	-	-	1
CO2	-	2	3	-	2	2	2	1	-	2	-	-	-	2
CO3	-	1	2	-	2	2	1	3	-	1	-	-	-	1
CO4	-	1	1	-	2	2	2	2	-	1	-	-	-	1

Course Title/Code	**Co-Curricular Activities EDO144**	
Course Type	**University Compulsory**	
Course Nature	**NTCC**	
L-T-P-0 Structure	**0-0-0-2**	
Credits	**0.5**	
Course Objective	**To develop and demonstrate pupils' skills, to instil in them a sense of independence and leadership, and to impart on them vocational skills.**	
Course Outcomes		
CO1	**Student teachers will develop the essential knowledge base to strengthen one's potential to organize and participate in diverse forms of co-curricular activities.**	**Employability**
CO2	**Student teachers will imbibe desirable values namely creativity, teamwork and co-operation in planning and executing different activities.**	**Skill Development**
CO3	**Student teachers will imbibe desirable values namely creativity, teamwork and co-operation in planning and executing different activities.**	**Entrepreneurship**
CO4	**Student teachers will appreciate the importance of co-curricular activities in the holistic development of human personality.**	**Skill Development**
CO5	**Student teachers show aptitude for planning and taking part in activities connected to the psychomotor domain.**	**Employability**

Section A

1. Board Decoration (On any theme pertaining to SDG)
2. Talent Hunt Competition
3. Organizing of Assembly based on diverse themes
4. Celebrating Unity in Diversity through festivals festivals with activities like Diya making/Rangoli Making (SDG 16)
5. Poster making - Taking care of Psychological Well- Being (SDG 3)
6. Board decoration (Theme - Environment) (SDG 13)
7. Skit on Gender Sensitization (SDG 5)
8. Caricature Competition - Importance to renewable resources (SDG 13)
9. Debate on various topics nurturing scientific temperament (SDG 4)
10. Hands on Session on Mindful-----ness (SDG 3)
11. Community Lunch (SGD 16)
12. Logo designing – Swachh Bharat (SDG3)

Section B

1. Board Decoration (On any theme pertaining to SDG)
2. Talent Hunt Competition
3. Organizing of Assembly based on diverse themes

4. Poem Recitation Competition (WORLD HEALTH DAY) (SDG 3)
5. Board decoration (Theme –Quality Education) (SDG 4)
6. CREATIVE WRITING (SDG 16)
7. DRAMA AND ART (ENVIRONMENT AWARENESS) (SDG 13)
8. Visit to any prominence place of national importance (SDG 16)
9. Carry out of Survey (Mental Health) (SDG 3)
10. Making of Digital Documentaries – Indian Culture (SDG 16)
11. Movie screening (SDG5)
12. Plantation Drive (SDG 13)

Reference Books

1. Anderson Earl W. "Extra-Curricular Duties". Educational Research Bulletin (Ohio State University) 1929 October 9 8:315-17
2. Ransom Sharon L. (2005). Co-curricular Activities: Their Values and Benefits; Mason Crest Publishers, US. 3. Ferguson (2001). Co-curricular Activities: A Pathway to Careers; Ferguson Publishing Company

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	3	3	2	3	-	2
CO2	3	2	1	-	-	-	-	2	1	2	1	3	-	2

CO3	3	3	-	-	-	-	-	1	1	1	1	-	2	2
CO4	3	2	-	-	-	-	-	3	3	2	3	2	-	3
CO5	3	3	-	-	-	-	-	3	3	3	2	2	-	3

Course Title/Code	**Environmental Sciences (CHH137)**	
Course Type	**University Compulsory**	
Course Nature	**NTCC**	
L-T-P-0 Structure	**(2-0-0-2)**	
Credits	**4**	
Course Objective	**The Environmental Studies programme trains students to be leaders in recognising and resolving difficult environmental concerns from an interdisciplinary, problem-solving perspective.**	
	Course Outcome	
CO1	**To understand about the concept of environmental education.**	**Entrepreneurship**
CO2	**To develop sense of awareness about the environmental pollution, and possible hazards and its causes and remedies.**	**Entrepreneurship, Skill Development**
CO3	**To build up a sense of responsibility towards conservation of environment, bio-diversity and sustainable development.**	**Skill Development**
CO4	**To widen reasonable understanding about the role of school and education in fostering the idea and learning to live in harmony with nature.**	**Employability**

SECTION-A

Multidisciplinary nature of environmental studies:Definition, scope and importance**,** Need for public awareness (OC)
Renewable and Non-Renewable Resources: Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizerpesticide problems, water logging, salinity, case studies.

SECTION-B

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies (OC). Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
Role of an individual in conservation of natural resources. (OC) Equitable use of resources for sustainable lifestyle
Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem., Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem :- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (OC)

Biodiversity and its conservation: Introduction – Definition: genetic, species and ecosystem diversity, Biogeographical classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values (OC), Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity (OC).

SECTION-C

Environmental Pollution:Definition, Cause, effects and control measures of :-Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management : Causes, effects and control measures of urban and

Industrial wastes. (OC), Role of an individual in prevention of pollution. (OC), Pollution case studies. (OC), Disaster management: floods, earthquake, cyclone and landslides.

Social Issues and the Environment:From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management,Resettlement and rehabilitation of people; its problems and concerns.
Case

Studies, Environmental ethics: Issues and possible solutions.

SECTION-D

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies (OC):Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act (OC)**,** Water (Prevention and control of Pollution) Act (OC)**,** Wildlife Protection Act**,** Forest Conservation Act**,** Issues involved in enforcement of environmental legislation (OC), Public awareness (OC).
Human Population and the Environment:Population growth, variation among nations, Population explosion – Family Welfare Programme, Environment and human health, Human Rights (OC), Value Education (OC), HIV/AIDS (OC), Women and Child Welfare (OC), Role of Information Technology in Environment and human health, Case Studies (OC). *OC = Outcome component

Field work

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain • Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.
- Any socially relevant problem identification and proposing its possible solution

NOTE: ManavRachna has adopted five villages, where students would be visiting, will identify the socially relevant issues and work on to provide possible solution.

Reference Books and Readings:

a) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
b) Bacharach, the Biodiversity of India, Maupin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email: mapin@icenet.net(R)
c) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
d) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

e) Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopaedia, Jaico Publ. House, Mumbai,
1196p
f) De A.K., *Environmental Chemistry*, Wiley Eastern.
g) *Down to Earth*, Centre for Science and Environment(R)
h) Gleick, H.P.1993.Waterincrisis, PacificInstituteforStudiesinDevEnvironment & Security. Stockholm Env. Institute Oxford Univ.
Press473p
i) Hawkins R.E., Encyclopaedia of Indian Natural History, Bombay Natural
History Society, Bombay(R)
j) Heywood, V.H &Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press1140p.
k) Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.
l) McKinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition.639p.
m) Bhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
n) Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co.(TB)
o) Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA,574p
p) Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd.345p.
q) Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
r) Survey of the Environment, The Hindu(M)
s) Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
t) Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media(R)
u) Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
v) WangerK.D., 1998EnvironmentalManagement.W.B.SaundersCo.
Philadelphia, USA 499p
(M) Magazine
(R)Reference
(TB) Textbook

Further Readings:

1. Cunningham W.P., CooperT.H. Gorhani Bharucha Erach, 2003.The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad– 380013, India. Email: mapin@icenet.net

2. BrunnerRC, 1989, HazardousWasteIncineration, McGrawHillInc.
3. Clark RS, Marine Pollution, Clanderson Press, Oxford (TB).

4. E&HepworthMT, 2001.Environmental Encyclopedia, JaicoPublishingHouse, Mumbai,1196pgs.

5. DeA. K., Environmental Chemistry, Wiley Eastern Ltd.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	2	2	----	----	2	2	1	3
CO2	2	2	2	3	2	2	1	2	----	----	2	2	1	3
CO3	2	2	2	1	3	2	2	1	----	----	2	2	2	1
CO4	1	1	2	2	2	2	1	2	----	----	2	2	2	3

SEMESTER - 2										
SUBJECT CODES	SUBJECT NAME	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/ Soft/ Workshop/ NTCC)	COURSE TYPE (Core/Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS
CHH 136T	States of Matter and Nuclear Chemistry	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH 136P	States of Matter and Nuclear Chemistry Lab				0	0	2	0		
PHH 122T	Elasticity, Waves, Heat and Thermodynamics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH 122P	Elasticity, Waves, Heat and Thermodynamics Lab				0	0	2	0		
EDH 132T	Bryophytes and Pteridophytes	EDU			3	0	0	0	5	
EDH 132P	Bryophytes and Pteridophytes Lab				0	0	2	0		
MAH147-T	Partial Differentiations and Integral Calculus	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4

MA H147 -P	Partial Differentiations and Integral Calculus Lab				0	0	2	0		
EDH 131T	Animal Diversity-II	Partial Differentiations and Integral Calculus+ A28:B44			3	0	0	0	5	
EDH 131P	Animal Diversity-II Lab				0	0	2	0		
MA H146 -T	Number Theory, Theory of Equations and Matrices	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MA H146 -P	Number Theory, Theory of Equations and Matrices Lab				0	0	2	0		
EDH 133T	Learner and Learning Process	EDU	HARD	CORE	3	0	0	0	5	4
EDH 133P	Learner and Learning Process Lab				0	0	2	0		
EDS 103	Creating An Inclusive Classroom	EDU	SOFT	CORE	1	0	2	0	3	2
MOOC18EEDS-101	Better Spoken English/	EDU	MOOC	CORE	0	0	0	2	0	2

MO OC19EEDS-101	Speaking Effectively									
EDS 134	Communicative English-II		SOFT	CORE	1	0	2	0	3	
CSW 115B	Critical Understanding in ICT-II	CST	WORKSHOP	CORE	0	0	3	0	3	1.5
EDW 125	Drama and Art Education	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDN 136	Project Report on Field Trip	EDU	NTCC	UNIVERSITY COMPULSORY	0	0	0	0	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				17(PCM)/14(ZBC)	4(PCM)/1(ZBC)	20(PCM)/18(ZBC)	2	43(PCM)/35(ZBC)	29(PCM)/25 (ZBC)

POST SECOND SEMESTER SUMMER TRAINING (EDO165) (1.5 Credits)

Course Title/Code	States of Matter and Nuclear Chemistry (CHH136-T)

Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	3-1-0-0	
Credits	3	
Course Objective	The student will use knowledge of states of matter to explain the chemical and physical properties of common elements and compounds.	
Course Outcomes (COs)		Mapping
CO1	To understand concepts of solids and gaseous state and demonstrate professional knowledge of the physical, social and intellectual development of students	Employability
CO2	To analyze various properties of liquids and colloids and develop the ability to conduct research in the related thrust area.	Skill Development
CO3	To explain the concepts of acids and bases and develop attitude of reflection, social entrepreneurship and innovation	Entrepreneurship
CO4	To understand the concepts related to atoms, nucleus and demonstrate the practical and theoretical understanding of core science courses: Botany/zoology/physics/chemistry/mathematics	Employability
CO5	Understand the concept and application of nuclear chemistry and demonstrate bridging of the gap between academia, industry and society through field-based projects and social engagements	Employability
Prerequisites	Nil	

SECTION A GASEOUS AND SOLID STATE

Explanation of the macroscopic properties of solids in terms of structure, bonding and defects. Definition of space lattice, unit cell. Laws of crystallography – (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Law of symmetry. Symmetry elements in crystals.X-ray diffraction by crystals. Derivation of Bragg equation. Predicting crystal structure. Defects in solids, Dielectric properties. Review a perfect gas connecting temperature with kinetic theory. Postulates of kinetic theory of gases,

deviation from ideal behaviour, van der Waals equation of state. The law of corresponding states, reduced equation of state. Molecular Velocities: Root mean square, average and most probable velocities.
Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. (8 L)

SECTION B LIQUIDS AND COLLOIDS

Accounting the Isotropic and intermediate behaviour of liquids as a link between solids and gases. Also tracing the role of liquids as solvents and reaction regulators Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases.
Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholesteric phases. Thermography and seven segment cell. Definition of colloids, classification of colloids.
Solids in liquids (sols): Properties – kinetic, optical and electrical; stability of colloids, protective action, Hardy – Schulze law, gold number.
Liquids in liquids (emulsions): Types of emulsions, preparation. Emulsifier.
Liquids in Solids (gels): Classification, preparation and properties, inhibition, general applications of colloids.

SECTION C ACIDS AND BASES

A discussion on changing concepts of acids and bases involving concentrations and effects of solvent medium. Arrhenius, BronstedLowry and Lewis concepts of acids and bases.
Hard and Soft Acids and Bases (HSAB) -Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness. (8 L)

SECTION D

NUCLEAR CHEMISTRY

To familiarise with the nuclear properties and phenomenon in order to understand the mechanism of some chemical reactions and synthesis of new elements. Fundamental particles of Nucleus, Concept of Nuclides isotopes, isobars and isotones (with specific examples), Qualitative idea of stability of the nucleus (n/p ratio), Natural and artificial radioactivity,

Radioactive Disintegration, half-life, average life, artificial transmutation, nuclear fusion and fission. Application of Radioactivity and Radio isotopes as tracers in analysis. (8 L)

References Books and Readings:

University Chemistry: Bruce Mahan
Concise Inorganic Chemistry: J D Lee
An Introduction to Inorganic Chemistry: Mackay and Mackay
Principles of Physical Chemistry: Marron and Prutton
Elements of Physical Chemistry: Samuel Glasstone and Lewis
Physical Chemistry: P W Atkins

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	1	--	--	--	--	2	1	1	1	2	2	1
CO2	1	2	1	--	--	--	--	2	1	1	1	2	2	1
CO3	1	2	2	--	--	--	--	2	1	--	1	2	2	1
CO4	2	1	1	--	--	--	--	2	1	1	--	3	2	1
CO5	3	2	-	-	-	-	-	3	2	1	-	--	--	--

Course Title/Code	**States of Matter and Nuclear Chemistry Lab (CHH136-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**0-0-2-0**

Credits	1	
Course Objective	**To skill students in handling instruments like pH meter, conductivity meter for various analysis for soil samples and other inorganic samples.**	
Course Outcomes (COs)		**Mapping**
CO1	**To introduce the basics of titration for determining strength of unknown – a knowledge highly recommended for industrial work**	**Skill Development**
CO2	**To identify different parameters (physical and chemical) to assess water quality**	**Employability**
CO3	**To demonstrate the ability to conduct research in different areas like soil analysis, etc.**	**Skill Development**
Prerequisites	**NIL**	

1. To evolve a scheme of analysis of anions and cations based on solubility products and common ion effect.
2. Classification of anions and cations.
3. Quantitative inorganic analysis of mixtures containing four radicals.
4. Determination of density by specific gravity bottle and viscosity of the given liquid by Ostwald's viscometer.
5. Determination of density by specific gravity bottle and surface tension of the given liquid by stalagmometer.
6. Measurement of vapour pressure of pure liquids and solutions, finding enthalpy of vaporisation of water.
7. Determination of refractive index of pure liquids and mixtures.
8. Determination of concentration of a given substance by colorimetry.

References:

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel
2. Practical Physical Chemistry, A Findlay

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	-	-	-	4	-	-	-	-	2	1	2	2	1
CO2	3	-	-	-	4	-	-	-	-	2	1	2	2	1
CO3	-	2	-	1	-	3	-	-	-	4	-	2	2	1

Course Title/Code	Elasticity Waves Heat & Thermodynamics (PHH122-T)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	3-1-0-0	
Credits	3	
Course Objective	Students would be able to understand the production and propagations of waves in elastic media. Further, they would be able to understand and apply the laws of heat & thermodynamics in dayto-day life problems	
Course Outcomes (COs)		Mapping
CO1	Students would be able to explain, demonstrate the concepts of elasticity, oscillations and waves and solve problems related	Skill Development
CO2	Students would be able to explain and compare the concepts and principles in kinetic theory of gasses and hence would be able to apply them on daily scenario.	Skill Development
CO3	Students would be able to demonstrate a clear understanding of laws of thermodynamics and apply basic concepts of heat on real life problems. They would further be able to formulate new problems based on thermodynamical laws	Skill Development
CO4	Students would be able to compare and apply the concepts of entropy and hypothesize problems related to entropy	Skill Development
Prerequisites (if any)		

SECTION A ELASTICITY AND WAVES

Hooke's law, Modulii of elasticity, Relation between elastic constants. Poisson's ratio – limiting values. Elastic potential Energy, bending moment. Theory of the cantilever. Torsion – calculation of couple per unit twist. The torsional pendulum. Static torsions, Searle's double bar experiment.

Oscillations: Simple Harmonic Motion (SHM), the restoring force along with its kinematical model, force law, SHM equation and idea of phase and phase difference, energy considerations in simple harmonic motion. Superposition of the SHMs, Lissajous figures, Equation for damped vibrations, forced vibrations. Analysis of complex waves. Fourier Series, Application to square wave, triangular wave.
Waves in elastic media: Review of Mechanical waves, types of waves, travelling waves, the superposition principle, wave speed, power and intensity in wave motion, expression for transverse waves in a stretched string, interference of waves, standing waves, resonance, simulation and demonstrations using ripple tank. **Sound Waves:** Audible, ultrasonic and infrasonic waves, propagation and speed of longitudinal waves, travelling longitudinal waves, standing longitudinal waves, vibrating systems and source of sound, beats and Doppler effect, wave equation for sound pressure, sound power and measuring unit (decibel). Model of sound being a pressure wave caused by longitudinally oscillating particles must be developed.

SECTION B KINETIC THEORY OF GASES

Introduction, Kinetic Theory of Gases, kinetic theory as particle model and usefulness of the model in explaining the regular structure of crystals (Review), an ideal gas – a macroscopic description, an ideal gas – a microscopic description, kinetic calculation of pressure, kinetic interpretation of temperature, ideal gas scale, intermolecular forces, specific heat of an ideal gas, law of equi-partition of energy. Mean free path, Maxwell' distribution law, distribution of molecular speeds, van der Waal's equations of State, critical constants, application to liquefaction of gases.

SECTION C

HEAT AND FIRST LAW OF THERMODYNAMICS

Thermal equilibrium, Zeroth law of thermodynamics, ideal gas temperature scale, heat as a form of energy, quantity of heat and specific heat, molar heat capacities of solids, the mechanical equivalent of heat, heat and work; First law of thermodynamics, Discussion on usefulness of First Law of Thermodynamics in Meteorology, some special cases of the first law of thermodynamics – (i) adiabatic process, (ii) isothermal process, (iii) isochoric process, (iv) cyclic process, (v) free expansion.

SECTION D

ENTROPY AND SECOND LAW OF THERMODYNAMICS

Introduction, reversible and irreversible processes, the Carnot cycle, Carnot engine, Carnot theorem, absolute scale of temperature, second law of thermodynamics, efficiency of engines, the thermodynamic temperature scale, entropy in reversible and irreversible processes, entropy and the II law, entropy and disorder, consequences of II and III law of thermodynamics, Second law of thermodynamics as a probabilistic statement. Low temperature Physics – Porous Plug experiment, temperature of inversion, principle of regenerative cooling, liquefaction of air by Linde's method.

References Books and Readings:

1. Fundamentals of Physics, 6th Edition, David Halliday, Robert Resnick and Jay Walker, John Wiley and Sons, Inc.
2. University Physics, Revised Edition, Harris Benson, John Wiley and Sons Inc.
3. Heat and Thermodynamics, Zeemansky, McGraw Hill.
4. Physics of Vibration and Waves, H J Pain.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	2	1	2	1	-	1	3	3	1	3	3	2
CO2	-	-	2	1	2	1	-	1	3	3	1	3	3	2
CO3	-	-	2	1	2	1	-	1	3	3	1	3	3	2
CO4	-	-	2	1	2	1	-	1	3	3	1	3	3	2

Course Title/Code	**Elasticity Waves Heat & Thermodynamics Lab (PHH122-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**Students would be able to understand the production and propagations of waves in elastic media. Further, they would be able to understand and apply the laws of heat & thermodynamics in dayto-day life problems**	
Course Outcomes (COs)		**Mapping**

CO1	**Students will be able to demonstrate an ability to conduct investigations of practical/technical issues.**	**Skill Development**
CO2	**they will demonstrate an ability to analyze data and reach a valid conclusion.**	**Skill Development**
Prerequisites (if any)		

List of Experiments

1. To determine the frequency of A.C. mains using sonometer.
2. To find the frequency and amplitude of given waves (sine wave triangular wave, square wave) using CRO.
3. To determine the modulus of rigidity of material of given wire by dynamical method using Maxwell needle.
4. To find the spring constant.
5. To determine J by Callender and Barne's constant flow method.
6. To determine coefficient of thermal conductivity of copper by Searle's apparatus.
7. To determine temperature coefficient of resistance by Pt resistance thermometer.
8. To study the variation of thermo-emf of a thermocouple with difference of temperature (Cu-Fe, Cu-Al) **Textbooks**

PSSC Physics Laboratory Guide.
Practical Physics, E Armitage, John Murray.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	-	-	3	-	3	3	-	-	3	-	3	-	1

CO2	3	-	-	3	-	3	3	-	-	3	-	-	2	1

Course Title/Code	**Bryophytes and Pteridophytes (EDH132-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**The course focuses on morphology, anatomy, reproduction, and evolution in Bryophytes and Pteridophytes. The students develop the basic understanding of important characteristics, anatomy, reproduction and evolution along with economic importance of these two groups.**	
Course Outcomes (COs)		**Mapping**
CO1	**To get acquainted with the structure, classification, and life history of Bryophytes.**	**Skill Development**
CO2	**To understand the Geological time scale and the importance of fossils.**	**Employability**
CO3	**To get acquainted with the structure, classification, and life history of Pteridophytes.**	**Skill Development**
CO4	**To analyse the evolutionary trends among Pteridophytes.**	**Entrepreneurship**

Prerequisites (if any)	Basic understanding of Plant Kingdom and Taxonomy

SECTION A Bryophytes- Origin, General characteristics, distribution, structure, reproduction, alternation of generation, classification, and economic importance

Study of morphology, anatomy and reproduction in- Hepaticopsida: *Marchanti*a, Anthocerotopsida: *Anthoceros*Bryopsida: *Funaria,* Affinities of bryophytes – brief account

SECTION B

General account of geological time scale, types of fossils, fossilization process, radioactive carbon dating, and importance of fossils, Study of *Rhynia, Lepidodendron, Lepidostrobus.*

SECTION C

Pteridophytes- General characters, distribution, structure, reproduction, life cycle, classification, and economic importance.
Study of morphology, anatomy, and reproduction in- Psilopsida: *Psilotum,*Lycopsida: *Lycopodium, Selaginella*
Sphenopsida: *Equisetem* Pteropsida: Marsilea

SECTION D

Evolution of steles in Pteridophytes
Origin and significance of heterospory and seed habit
Apogamy and Apospory

References Books and Readings:

- Smith.G.M. (1971). Cryptogamic Botany Vol.II. New Delhi: TMH Publishing House.
- Sporne, K.R. (1974). Morphology of Pteridophytes. London: Hutchinson & Co.
- Rashid, A. (1999). An Introduction to Pteridophyta.Vikas Publishing House.

- Pandey, Mishra & Trivedi. (2004). A Textbook of Botany Vol.II, Meerut: Rastogi Publications.
- Singh,V., Pande, P. &Jain,D.K. (2006). A Textbook of Botany. Meerut: Rastogi Publications.
- Singh,V., Pande, P. & Jain, D.K. (2005).Diversity and Systematics of Seed plants. Meerut: Rastogi Publications.
- Parihar, N.S. (1961). Bryophyta.Central Book Depot.
- Parihar, N.S. (1966). PteridophytesAn Introduction of Embryophyta: Volume II.Central Book Depot.
- Vashishta, P.C. (1982). Peridophyta. New Delhi: S.Chand& Co. Ltd.
- Gangulee H.C., Kar, A.K. (1982). College Botany Vol.II. Calcutta: New Central Book Agency.

- Anrold, C.A. (1947). An Introduction to Palaeobotany. London: McGraw-Hill Book Company Inc.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	---	----	----	---	2	1	1	1	3	1	1
CO2	2	1	2	---	----	----	---	2	1	1	1	3	1	1
CO3	2	1	2	---	----	----	---	2	1	1	1	3	1	1
CO4	2	1	2	---	----	----	---	2	1	1	1	3	1	1

Course Title/Code	**Bryophytes and pteridophytes Lab (EDH132-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**The course deals with the characteristics and economic importance of Bryophytes and Pteridophytes.**	
Course Outcomes (COs)		**Mapping**
CO1	**To observe and identify temporary micro-preparations and permanent slides.**	**Skill Development**
CO2	**Study of the taxa included under Bryophytes and Pteridophytes by observing temporary micro-preparations and permanent slides.**	**Employability**
CO3	**Study of the morphology, thallus organization and reproductive structures of taxa studied in Bryophytes and Pteridophytes through permanent slides.**	**Skill Development**
CO4	**To prepare temporary, double-stained micro-preparations.**	**Entrepreneurship**

Prerequisites (if any)	Basic understanding of Plant Kingdom and Taxonomy

Practical

1. To observe and identify temporary micro-preparations and permanent slides
2. Study of the taxa included under Bryophytes and Pteridophytes by observing temporary micro-preparations and permanent slides.
3. To develop the skill of freehand sectioning, staining, and mounting, Bryophytes and Pteridophytes.
4. To prepare temporary, double-stained micro-preparations.
5. Study of the morphology, thallus organization and reproductive structures of taxa studied in Bryophytes and Pteridophytes through permanent slides.
6. Preparation and submission of 2 double-stained slides

References Books and Readings:

- Smith.G.M. (1971). Cryptogamic Botany Vol.II. New Delhi: TMH Publishing House.
- Sporne, K.R. (1974). Morphology of Pteridophytes. London: Hutchinson & Co.
- Rashid, A. (1999). An Introduction to Pteridophyta.Vikas Publishing House

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	-	2	2	-	-	2	3	-	3	-	2
CO2	3	3	3	-	3	3	-	-	2	3	-	3	-	-
CO3	3	2	2	-	3	3	-	-	2	2	-	2	2	-
CO4	2	2	3	-	2	2	-	-	2	3	-	3	2	-

Course Title/Code	**Partial Differentiations and Integral Calculus (MAH147-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**4**	
Course Objective	**To acquaint the learner with fundamentals of partial differentiation.**	
Course Outcomes (COs)		**Mapping**
CO1	**Describe and demonstrate common computer literacy skills**	**Skill Development**
CO2	**Understand the fundamentals of the internet and perform basic internet skills;**	**Employability**
CO3	**Describe and perform basic word processing skills;**	**Skill Development**

CO4	**Enhance a word-processed document by including appropriate visual components**	**Entrepreneurship**
Prerequisites (if any)		

Unit I: Partial Derivatives – I

Functions of two or more variables, Limits, Continuity, Partial derivatives, Differentiable functions, Linear approximation theorem.

Unit II: Partial Derivatives - II

Homogeneous functions, Euler's Theorem, Chain Rule, Change of Variable, Directional Derivative, Partial Derivatives of higher order, Derivate of Implicit functions.

Unit III: Applications of Partial Derivatives

Jacobians, Properties of Jacobians ,Taylor's theorem for a function of two variables, Maxima and Minima of function of two variables, Lagrange Method of Undetermined Multipliers.

Unit IV: INTEGRAL CALCULUS

Integration of Standard Forms, Definition of Integration. Elementary Principle, Fundamental Integrals, Derivation of Formulae, Simple Applications of Integration, Derivative of Area. Area of Curve, Integration of Rational Fractions, Formulae for Integration of Rational Functions, Integration of Irrational Functions, Integration by Parts. Reduction Formulae, Integration by Substitution, Integration as a Summation., Definite Integrals.

References :

1. Calculus by Anton,Wiley.
2. Calculus with Analytic Geometry by S K Stein, McGraw Hill.

3.Calculus and Analytical Geometry by Thomas and Finney, S.Chand and Co. Ltd.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3

CO1	2	2	3	-	2	2	-	-	2	3	-	3	-	2
CO2	3	3	3	-	3	3	-	-	2	3	-	3	-	-
CO3	3	2	2	-	3	3	-	-	2	2	-	2	2	-
CO4	2	2	3	-	2	2	-	-	2	3	-	3	2	-

Course Title/Code	**Partial Differentiations and Integral Calculus (MAH147-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**0-0-2-0**
Credits	**4**
Course Objective	To enable a learner to apply concept of Partial differentiation in real life.
Course Outcomes (COs)	
CO1	Describe and demonstrate common computer literacy skills
CO2	Understand the fundamentals of the internet and perform basic internet skills;
CO3	Describe and perform basic word processing skills;
CO4	. Enhance a word-processed document by including appropriate visual components.
Prerequisites (if any)	

LAB EXERCISE:

1. Solution of Cauchy problem for first order PDE.

2. Finding the characteristics for the first order PDE.

3. Plot the integral surfaces of a given first order PDE with initial data.
4. Solution of the wave equation $\partial 2u\partial t2-c2\partial 2u\partial x2=0$ for any two of the following associated conditions: a.

   $u(x,0)=\emptyset(x), ut(x,0)=\varphi(x), x\in R, t>0$.

b. $u(x,0)=\emptyset(x)$, $ut(x,0)=\varphi(x)$, $u(0,t)=0$, $x\in(0,\infty)$, $t>0$.

c. $u(x,0)=\emptyset(x)$, $ut(x,0)=\varphi(x)$, $ux(0,t)=0$, $x\in(0,\infty)$, $t>0$.

d. $u(x,0)=\emptyset(x)$, $ut(x,0)=\varphi(x)$, $u(0,t)=0$, $u(l,t)=0$, $0<x<l$, $t>0$.

5. Solution of one-dimensional heat equation ut=kuxx ,for a Homogeneous rod of length l i.e. to solve the IBVP:

ut=kuxx ,$0<x<l,t>0$

$u(0,t)=0, u(l,t)=0, t\geq 0$,

$u(x,0)=f(x), 0\leq x\leq l$

RECOMMENDED BOOKS:

1. TynMyint-U and LokenathDebnath, Linear Partial Differential Equation for Scientists and Engineers, Springer, Indian reprint, 2006.

2. Ioannis P Stavroulakis and Stepan A Tersian, Partial Differential Equations: An Introduction with Mathematica and MAPLE, World Scientific, Second Edition 2004.

3. M.D. RaiSinghania : Advanced differential equations

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	-	2	2	-	-	2	3	-	3	-	2
CO2	3	3	3	-	3	3	-	-	2	3	-	3	-	-
CO3	3	2	2	-	3	3	-	-	2	2	-	2	2	-
CO4	2	2	3	-	2	2	-	-	2	3	-	3	2	-

Course Title/Code	**Number Theory, Theory of Equations and Matrices (MAH146-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**4**	
Course Objective	**To equip the students with the concept of theory of number, equations and matrices.**	
Course Outcomes (COs)		**Mapping**
CO1	**Apply the concept of numbers system for higher level.**	**Skill Development**

CO2	**Prove results involving divisibility and greatest common divisors;**	**Skill Development**
CO3	**Find integral solutions to specified linear Equations;**	**Skill Development**
CO4	**Apply the concept of rank to solve system of equation.**	**Skill Development**
CO5	**Analyze the concept of Eigen value's and eigen vectors and their properties.**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of sets and number system.**	

SECTION A

Theory of Numbers

Division Algorithm – Prime and Composite Numbers – proving the existence and uniqueness of GCD and the Euclidean Algorithm – fundamental theorem of Arithmetic - the least common multiple – congruences – linear congruences – Wilson's theorem – Simultaneous congruences – Theorem of Euler – Fermat and Lagrange.

SECTION B

Theory of Equations

Relation between roots and coefficients, Symmetric functions, Transformations, Reciprocal equations, Descarte's rule of signs,Multiple roots, Solving cubic equations by Cardon's method, Solving quartic equations by Descarte's method and Ferrari's method.

SECTION C

Matrices – I

Matrices of order $m \times n$, Algebra of matrices, Symmetric and Skew Symmetric, Hermitian and Skew Hermitian matrices and their standard properties, Determinants Adjoint of a square matrix, Singular and non-singular matrices, Rank of a matrix, Elementary row / column operations, Invariance of rank under elementary operations, Inverse of a non-singular matrix by elementary operations.

SECTION D

Matrices - II

System of m-linear equations in n-unknowns, Matrices associated with linear equations, Trivial and non-trivial solutions, Criterion for existence of non-trivial solution of homogeneous and non- homogeneous systems, Criterion for uniqueness of solutions. Eigen values and Eigen vectors of a square matrix, Characteristic equation of a square matrix, Eigen values and Eigen vectors of a real symmetric matrix properties, Diagonalisation of a real symmetric matrix, Cayley – Hamilton theorem, Applications to determine the powers of square matrices and Inverse of non-singular matrices.

REFERENCES

1. Elementary Number Theory by David M. Burton.
2. Algebra by Natarajan, M. Pillay and Ganapathy, S. Vishwanath Pvt. Ltd.
3. Theory of Equations by Uspensky, McGraw Hill Book Co. Ltd.
4. Matrices by Frank Ayres, Schaum Publishing Co.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	----	2	1	----	3	2	----	3	----	2	3	----	1
CO2	2	----	2	1	----	3	2	----	2	----	2	3	----	3

CO3	3	----	2	1	----	2	3	----	3	----	3	3	----	2
CO4	2	----	2	1	----	2	3	----	2	----	2	3	----	3
CO5	3	----	2	1	----	3	2	----	3	----	3	3	----	----

Course Title/Code	**Number Theory, Theory of Equations and Matrices (MAH146-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-1-0-0**
Credits	**4**
Course Objective	**To equip the students with the concept of theory of number, equations and matrices.**

Course Outcomes (COs)	**Mapping**

CO1	**To be able to find quotients and remainders from integer division**	**Skill Development**
CO2	**To be able to design efficient algorithms (and providing complexity analysis) for the most important problems**	**Skill Development**
CO3	**To be able to recognize the connection between set operations and logic**	**Skill Development**
Prerequisites (if any)	**.**	

LAB EXERCISES

1. To study the divisibility of integers .

2. Operate on prime numbers, check and prove primality.

3. Factorization of integers, verification of factorization algorithms.

4. To find Quotients and remainders, primitive roots, orders of residue classes, Euler's quotient function.

5. Solve linear congruences, compute modular roots.

6. To develop and study Bernoulli, Fibonacci, Mersenne, and other sequences of numbers.

7. To verify Euler phi, Carmichael, Moebius, and other number theoretic functions.

8. ASCII encoding and decoding, continued fraction expansion.

9. To find the Rank of a matrix, Inverse of a Square matrix and to reduce a matrix into Normal Form.

10 To solve the system of simultaneous linear equations.

11 To find the Eigen values and Eigenvectors of a square matrix.

RECOMMENDED BOOKS

1. Elementary Number Theory and its applications, 5th edition, by Kenneth H. Rosen.

2. Elementary Number Theory by D. Burton

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	----	2	1	----	3	2	----	3	----	2	3	----	1
CO2	2	----	2	1	----	3	2	----	2	----	2	3	----	3
CO3	3	----	2	1	----	2	3	----	3	----	3	3	----	2

Course Title/Code	**Animal Diversity-II (EDH131-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**To enable students to understand invertebrates and vertebrates, their organizational hierarchies and complexities; the evolutionary trends in external morphology and internal structure; identification and classification with examples; to enable them to understand various modes of adaptations in animals.**	
Course Outcomes (COs)		**Mapping**
CO1	**Critically analyse the basic structure, classification and life history of Arthropoda, Mollusca and Echinodermata**	**Skill Development**
CO2	**Comprehend the systemic position and phylogeny of Onycophora**	**Skill Development**
CO3	**Reflect upon the classification of Mollusca and to gain the knowledge of formation of the pearl**	**Employability**

CO4	**To have the Knowledge of the evolutionary trends among Arthropoda, Mollusca and Echinodermata**	**Skill Development**
CO5	**Critically analyze the classification Of Protochordate**	**Skill Development**
CO6	**Critically analyze the classification and life history of Cylostomata**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of animal kingdom**	

SECTION A ARTHROPODA AND ONYCHOPHORA

Arthropoda: General characters and classification of Phylum Arthropoda up to
orders with examples. Type study: Palaemon– External morphology, digestive system, circulatory system, respiratory system, excretory system and reproductive system; Mouth parts in Insects; Metamorphosis in insects; Crustacean larvae (Nauplius, Zoaea, Mysis and Megalopa) and their significance .Insects as vectors a. mosquito b. housefly c. sand-fly d. tsetse fly. Social behavior in Honey Bees. Onychophora: Salient features of Peripatus, systematic position and phylogeny of Onychophora.

SECTION B MOLLUSCA

General characters and classification of Phylum Mollusca up to orders with examples (1); Type study: Pila– External morphology, digestive system, respiratory system and life cycle ; Modifications of foot in Mollusca ;
Comparative account of
shells in Mollusca ; Torsion and detorsion in Mollusca .Pearl formation in Mollusca Molluscan larvae :Glochidium and Veliger

SECTION C ECHINODERMATA

General characters and classification of Phylum Echinodermata up to orders with example; Type study: Asterias– External morphology, digestive system, water- vascular system, haemocoel system and reproductive system ; Life-cycle and metamorphosis; Pedicellaria ; Skeletal system in Echinoderm , Echinoderm larvae and their significance- Bipinnaria and Auricularia

SECTION D
CHORDATA – PROTOCHORDATA AND CYCLOSTOMATA

Chordata: General characters and outline classification of Phylum Chordata up to orders with examples
Protochordata: i) Balanoglossusand its affinities (1); Tornaria larva ; ii) Amphioxus – Digestive system, circulatory system and nervous system.
Cyclostomata: General characters, affinities and classification of Class Cyclostomataup to orders with examples; Type study: Petromyzon– External morphology, digestive system and respiratory system ;
Structure and metamorphosis of Ammocoetes larva ; Comparison of organ systems between Petromyzon and Myxine.

References Books and Readings:

1. Invertebrate Zoology by E.L.Jordon and P.S. Verma – S. Chand & Co., Delhi).
2. Invertebrate Zoology by J.K.Dhami and P.S.Dhami – S. Chand & Co., Delhi).
3. Invertebrate Zoology series (Protozoa to Echinodermata) by R.L. Kotpal – (Rastogi Publications, Meerut, 2008).
4. A Textbook of Invertebrate Zoology by S.N. Prasad – (Kitab Mahal, Allahabad).

5. A life of Invertebrates by Russel and Hunter – (MacMillan) 6. Invertebrate Zoology by Redarns – (W.B.Saunders, Philadelphia)
7. The Invertebrate series of L.H.Hyman – (McGraw Hill).
8. A student's textbook of Zoology by Adam Sedgwick Vol. I, II & III – (Central Book Depot, Allahabad).
9. A Textbook of Zoology vol.1 by Parkar and Haswell – (MacMillan).
10. Destructive and Useful Insects- Their habits and control by Metcalf and Flint – (Tata McGraw Hill, New Delhi).
11. Protochordates by K.S. Bhatia.
12. Modern Textbook of Zoology Invertebrates by R.L. Kotpal – (Rastogi Publications, Meerut, 10th Revised Edition, 2008).
13. Modern Textbook of Zoology: Vertebrates by R.L. Kotwal – (Rastogi Publications, Meerut, 3rd Edition, 2008).

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	-----	3	1	-----	2	1	1	1	3	3	3
CO2	2	1	1	-----	3	1	-----	2	1	1	1	3	3	3
CO3	2	1	1	-----	3	1	-----	2	1	1	3	3	3	3
CO4	2	1	1	-----	3	1	-----	2	1	1	1	3	3	3
CO5	2	1	1	-----	2	1	-----	2	1	1	3	3	3	3
CO6	2	1	1	-----	2	1	-----	2	1	1	1	3	3	3

Course Title/Code	**Animal Diversity-II Lab (EDH131-P)**
Course Type	**Core**

L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection, display and Labelling; of collection, preservation, mounting, identification and Labelling of collected specimens; of field observation of animals.**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection, display and Labelling**	**Skill Development**
CO2	**To develop in the students the skills of collection, preservation, mounting of specimens**	**Skill Development**
CO3	**To develop in the students the skills of identification and Labelling of collected specimens**	**Skill Development**
CO4	**To develop in the students the skills of field observation of animals**	**Skill Development & Employability**
Prerequisites (if any)	**-----**	

Dissection of Palaemon and flag Labelling: Digestive system ,Nervous system,Mounting of appendages.
Study of specimens of Arthropoda and Onychophora: Lepas ,Balanus , Hippad ,Cancer , Limulus ,Scolopendra,Spirobolus, PeripatusStudy of mouth parts,Culex/Anopheles ,Periplaneta ,Apisd) butterfly,Study of Crustacean larvae ,Nauplius, Zoaea, Mysis , Megalopa,Preparation of permanent slides of fresh water and marine crustacean specimens, Identification and classification of

Anopheles, Culex and Aedes mosquitoes.Study of specimens and permanent slides of Mollusca: Pila ,Unio ,Sepia ,Octopuse e) Chito Dentalium ,Radula of Pila, T.S. of Ctenidium, Glochidium, Dissection and mounting of Pila (Study of dissected specimen):Nervous system , radulaStudy of specimens and permanent slides of Echinodermata: Astropecten/ Asterias b) Ophiothrix ,Echinus Holothuria ,Antedon , Bipinnaria larva,Ophiopluteuslarvah) Echinopluteuslarva , Pedicellaria
Study of specimens and permanent slides of Protochordata: Balanoglossus:a) Entireb, T.S. through proboscis ,T.S. through collar ,T.S. through trunk region Ascidia Doliolum ,Salpa Amphioxus, Entire ,T.S. through oral cirri ,T.S. through pharynx d) T.S. through intestinee) T.S. through tail ,Study of specimens of Cyclostomata: Petromyzon Myxine Field Visit- Zoo

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	-	-	2	1	-	-	-	-	1	3	2
CO2	1	1	2	-	-	-	2	-	-	--	-	1	3	3
CO3	1	-	2	--	-	2	1	-	-	-	-	1	3	3
CO4	-	2	3	--	--	1	2	--	-	3	-	-	2	3

Course Title/Code	**Learner and Learning Process (EDH133-T)**
Course Type	**Core**

Course Nature	Hard	
L-T-P-0 Structure	3-0-0-0	
Credits	3	
Course Objective	To enable a learner to become aware of aspects of learning and learning process	
Course Outcomes (COs)		Mapping
CO1	Comprehend the Nature of both the Psychology of the learner and Learning	Employability
CO2	Assimilate the nature of different components of cognition and their role in producing learning	Skill Development
CO3	Apply the knowledge of concepts and principles of growth in the classroom situation	Entrepreneurship
CO4	Elucidate the concept of Group dynamics in their day-to-day activities.	Entrepreneurship
CO5	Exhibit all the traits of an effective teacher	Skill Development
Prerequisites (if any)		

SECTION A

EDUCATIONAL PSYCHOLOGY, LEARNING AND MOTIVATION

Educational Psychology - Meaning, Scope and Importance, Concept & factors affected to the learning
Approaches to learning- Behaviorism, Cognitivism, Humanism, Social Constructivism Theories of learning (Pavlov, Skinner, Thorndike, Kohler, Roger , Vygotsky) and their educational implications
Motivation in learning: Concept, types and educational implications, Abraham Maslow's Motivational Theory, Role of Teacher in Motivation.

SECTION B

INTELLIGENCE, CREATIVITY AND PERSONALITY

Intelligence: Meaning, theories of intelligence-Spearman, Thorndike, Thurstone, Gardener and Guilford, Measurement of intelligence, uses and limitations of intelligence test.

Creativity - concept, identification of creative potential, educational programme for developing creativity Intelligence and Creativity

Personality- concept, big five theory, and Jung's theory

SECTION C

ADOLESCENTS AND DEVELOPMENT

Role of Heredity and Environment in human development

Concept of growth and development, Principles of development, Dimensions and stages of development, Factors influencing development (with special reference to Adolescents) Developmental characteristics of an adolescent: Physical, Cognitive, Social, Emotional, Moral & Language

Role of teacher, Parents and Society in catering the needs and problems of Adolescents

SECTION D

THEORIES OF GROWTH AND DEVELOPMENT

Piaget's Cognitive Development Theory- Concept, Stages and Implications Kohlberg 's Theory of Moral Development- Concept, Stages and implications

Erickson's Theory of social and moral development- Concept, stages and implications with special reference to Indian context. Maria Montessori's Planes of development.

Reference Books and Readings

1. Claridge, Gordon & Davis, Caroline (2003). *Personality and Psychological Disorders*. New Delhi: Atlantic Publishers.
2. Arnes, Peter at al (Ed.), (1984). Personality Development and learning, A Reader Kent
3. Bower, G. H., (1986). The Psychology of Learning and Motivation, Academic Press
4. Gange R. M. and Briggs, L. J., (1979). Principles of Instructional Design, New York; Halt
5. Chauhan S. S., (1983). Advanced Educational Psychology, (5th revised edition) Hodder and Stoughton Bernard, H. W., (1954). Psychology of Learning and Teaching, New York; MgGraw Hill

6. Joshi, Kirit. (2011). Child, Teacher and Teacher Education. Gandhinagar: Children University.
7. Kochar, S. K., Method & Techniques of Teaching, New Delhi; Sterling Publishers.
8. Kratochwill, Thomas R., (1983). Advances in School Psychology, New Jersey; Lawrence Erlbaum Associated Publishers.
9. Kundu, C. L., and Tutoon, D. N. (1985). Educational Psychology, New Delhi; Sterling Publishers.
10. Rinehart and Winston Gange, R. M. and Briggs, L. J., (1979). The Conditions of Learning and Theory ofInstruction, New York; Halt, Rinehart and Winston
11. Malek Parveenbanu M.,(2014). Technology & Teacher, Ahmedabad; SSTCT Publication.
12. Cole, M., Cole, S. R. and Lightfoot, C. (2004). *The Development of Children.* New York: Worth Publishers 13. D. K. Behera (Ed.), *Childhoods in South Asia.* New Delhi: Pearson Education India.
14. Farrell, M. (2009).*Foundations of Special Education: An Introduction*. (4th ed.). Wiley Blackwell
15. Gardner, H. (1980). Frames of mind: The theory of multiple intelligence.London:
16. H.Havighurtst, R. et al.(1995). *Society and Education*. Baston: Allyen ad Bacon
17. Piaget, J. (1952). *The Origins of Intelligence in Children*. New York: International University Press.
18. Newman, B. M. and Newman, P.H. (2007). *Theories of Human Development.* London: Lawrence Erlbaum Associates, publishers.Paladin Books
19. Saraswathi, T.S. (Ed). (1999). *Culture, Socialisation and Human Development: Theory, Research and Application in India*. New Delhi: Sage.
20. Sharma, K.N. (1990). *Systems, Theories and Modern Trends in Psychology*.Agra: HPB
21. Singh, Agya Jit (2012). *Development of the Learner and Teaching-Learning Process.*Patiala: Twenty First Century Publications.
22. Woolfork, A (2014). *Educational Psychology(12th ed.). New Delhi: Pearson Education.*

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	1	2	2	3	3	----	3	----	----
CO2	3	2	1	1	1	1	2	2	3	3	3	----	3	2
CO3	---	1	1	1	1	1	2	1	2	3	3	3	---	2

CO4	2	1	1	1	1	1	1	1	2	3	3	---	2	2
CO5	1	1	1	1	1	1	2	1	2	3	3	---	2	2

Course Title/Code	**Learner and Learning Process Lab (EDH133-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To enable learners to apply concepts of Education Psychology in real life situations w.r.t Education.**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop teaching aids as per interests and capabilities of the learners.**	**Skill Development**
CO2	**To assign tasks /assignments as per the abilities of the learners**	**Employability**
CO3	**To enable a learner to test various factors of personality of an individual**	**Entrepreneurship**
Prerequisites (if any)		

- Prepare your own SWOT analysis
- Prepare a case study on an adolescent near you and mention his/her problems during that period and provide remedial measures after discussing the case with your teacher.
- Study of a case and prepare a report on influential factors of learning
- *Conduct a Sociometric Test in the class and interpret the result
- Discuss the role of Emotions in the learning process
- Presentation on educational implications of any one learning or development theory
- Administration and Interpretation of any one psychological test - Intelligence test/Personality test/Creativity test/Attitude test/Aptitude test.
- Conduct an experiment on transfer of learning
- Preparation of learner profile based on cognitive/non-cognitive characteristics
- Analysis of classroom teaching episode in the light of teaching skills / strategies

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3

CO1	3	2	3	2	3	---	2	2	1	2	---------	3	-------	-------
CO2	1	2	2	3	3	2	1	2	1	1	3	-------	3	2
CO3	3	2	3	2	1	----	1	3	1	2	3	3	--------	2

Course Title/Code	Creating An Inclusive Classroom (EDS103)	
Course Type	Soft	
Course Nature	Core	
L-T-P-0 Structure	1-0-2-0	
Credits	2	
Course Objective	Student Readiness for Future Teaching in an Inclusive Classroom	
Course Outcomes (COs)		Mapping
CO1	To understand the meaning and need of inclusion in education	Employability
CO2	To get familiarized with various policies, programmes and schemes promoting inclusive education	Skill Development
CO3	To identify the social, economic, and physical diversity that exists amongst learners	Entrepreneurship
CO4	To recognize the challenges in Inclusive Education	Entrepreneurship
CO5	To appreciate the role of a teacher and various other stakeholders in making inclusion a success	Skill Development
Prerequisites (if any)		

SECTION A

INTRODUCTION TO INCLUSIVE EDUCATION

Marginalisation vs. Inclusion: Meaning & Definitions, Changing Practices in Education of Children with Disabilities: Segregation, Integration & Inclusion

Diversity in Classrooms: Learning Styles, Linguistic & Socio-Cultural Multiplicity, Principles of Inclusive Education: Access,

Equity, Relevance, Participation & Empowerment, Barriers to Inclusive Education: Attitudinal, Physical & Instructional **SECTION B**

POLICES & FRAMEWORKS FACILITATING INCLUSIVE EDUCATION

1. International Declarations: Universal Declaration of Human Rights (1948), World Declaration for Education for All (1990)
2. International Conventions: Convention against Discrimination (1960), Convention on Rights of a Child (1989), United Nations Convention of Rights of Persons with Disabilities (UNCRPD) (2006)
3. International Frameworks: Salamanca Framework (1994), Biwako Millennium Framework of Action (2002)
4. National Commissions & Policies: Kothari Commission (1964), National Education
5. Policy (1968), National Policy on Education (1986), Revised National Policy of Education (1992), National Curricular Framework (2005), National Policy For
6. Persons With Disabilities (2006)
7. National Acts & Programs: IEDC (1974), RCI Act (1992), PWD Act (1995), National 8. Trust Act (1999), SSA (2000), RTE (2006), RMSA (2009), IEDSS (2013)

SECTION C

ADAPTATIONS ACCOMODATIONS AND MODIFICATIONS

1. Meaning, Difference, Need & Steps
2. Specifics for Children with Sensory Disabilities
3. Specifics for Children with Neuro-Developmental Disabilities
4. Specifics for Children with Loco Motor & Multiple Disabilities
5. Engaging Gifted Children

INCLUSIVE ACADEMIC INSTRUCTIONS

1. Universal Design for Learning: Multiple Means of Access, Expression, Engagement
2. & Assessment

3. Co-Teaching Methods: One Teach One Assist, Station-Teaching, Parallel Teaching,
4. Alternate Teaching & Team Teaching
5. Differentiated Instruction: Content, Process & Product
6. Peer Mediated Instruction: Class Wide Peer Tutoring, Peer Assisted Learning Strategies 7. ICT for Instruction

SECTION D

SUPPORTS AND COLLABORATIONS FOR INCLUSIVE EDUCATION

1. Stakeholders of Inclusive Education & Their Responsibilities
2. Advocacy & Leadership for Inclusion in Education
3. Family Support & Involvement for Inclusion
4. Community Involvement for Inclusion
5. Resource Mobilisation for Inclusive Education

Reference Books and Readings

1. Bartlett, L. D., & Weisentein, G. R. (2003). Successful Inclusion for Educational Leaders. New Jersey: Prentice Hall.
2. Chaote, J. S. (1991). Successful Mainstreaming. Allyn and Bacon.
3. Choate, J. S. (1997). Successful Inclusive Teaching. Allyn and Bacon.
4. Daniels, H. (1999) . Inclusive Education.London: Kogan.
5. Deiner, P. L. (1993). Resource for Teaching Children with Diverse Abilities, Florida: Harcourt Brace and Company.
6. Dessent, T. (1987). Making Ordinary School Special. Jessica Kingsley Pub.
7. Gargiulo, R.M. Special Education in Contemporary Society: An Introduction to Exceptionality. Belmont: Wadsworth.
8. Gartner, A., & Lipsky, D.D. (1997). Inclusion and School Reform Transferring America's Classrooms,Baltimore: P. H.

Brookes Publishers.

9. Giuliani, G.A. & Pierangelo, R. (2007). Understanding, Developing and Writing IEPs. Corwin press:Sage Publishers. 10. Gore, M.C. (2004) . Successful Inclusion Strategies for Secondary and Middle School Teachers, Crowin Press, Sage Publications.
11. Hegarthy, S. & Alur, M. (2002). Education of Children with Special Needs: from Segregation to Inclusion, Corwin Press, Sage Publishers.
12. Karant, P., & Rozario, J. ((2003). Learning Disabilities in India. Sage Publications.
13. Karten, T. J. (2007). More Inclusion Strategies that Work. Corwin Press, Sage Publications.
14. King-Sears, M. (1994). Curriculum-Based Assessment in Special Edcuation. California: Singular Publications.

Activities

1. Visit Special Schools of any two Disabilities & an Inclusive school & write observation report highlighting pedagogy
2. Prepare a Checklist for Accessibility in Mainstream Schools for Children with Disabilities
3. Design a Poster on Inclusive Education
4. Prepare a Lesson Plan on any one School subject of your choice using any one **5.** Inclusive Academic Instructional Strategy

Reference Books and Readings

1. Lewis, R. B., & Doorlag, D. (1995). Teaching Special Students in the Mainstream. 4th Ed. New Jersey: Pearson.
2. McCormick, S. (1999). Instructing Students who Have Literacy Problems. 3rd Ed. New Jersey, Pearson.
3. Rayner, S. (2007). Managing Special and Inclusive Education, Sage Publications.
4. Ryandak, D. L. & Alper, S. (1996). Curriculum Content for Students with Moderate and Severe Disabilities in Inclusive Setting. Boston, Allyn and Bacon.
5. Sedlak, R. A., & Schloss, P. C. (1986). Instructional Methods for Students with Learning and Behaviour Problems. Allyn and Bacon.
6. Stow L. & Selfe, L. (1989). Understanding Children with Special Needs. London: Unwin Hyman.

7. Turnbull, A., Turnbull, R., Turnbull, M., & Shank, D.L. (1995). Exceptional Lives: Special Education in Today's Schools. 2nd Ed. New Jersey: Prentice-Hall.Inc.

8. Vlachou D. A. (1997). Struggles for Inclusive Education: An Ethnographic Sstudy.

9. Philadelphia: Open University Press.Westwood, P. (2006). Commonsense Methods for Children with Special Educational Needs - Strategies for the Regular Classroom. 4th Edition, London Routledge Falmer: Taylor & Francis Group.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	2	---	---	1	1	2	2	1	3	--	2
CO2	2	2	1	2	---	1	1	---	2	1	1	2	--	3
CO3	2	3	2	3	1	3	2	1	2	3	1	3	1	-
CO4	3	3	1	2	2	2	2	2	2	2	1	2	1	-

Course Title/Code	**Better Spoken English/Speaking Effectively (MOOC-18E-EDS-101)**
Course Type	**Core**
Course Nature	**NTCC**
L-T-P-0 Structure	**0-0-0-2**
Credits	**2**
Course Objective	**Student Readiness for Spoken English**

Course Outcomes (COs)		Mapping
CO1	**To read and comprehend the major points discussed in various types of written texts.**	**Employability**
CO2	**To use acceptable English in academic writing.**	**Skill Development**
CO3	**To build up their vocabulary.**	**Entrepreneurship**
CO4	**To make academic presentations precisely, logically, and effectively.**	**Skill Development**
Prerequisites (if any)	**NA**	

Sl. No. Topic/s 1 Why a course in Spoken English?

2 Student Presentation: Cycle I : Who I am

3 Feed Back on Presentation

4 Aspects of Theatre in Formal Presentation : Grooming,Body Language,Eye Contact,Voice Modulation

5 Linguistic Aspects of Mishearing

6 A “Good” Tempo of Speech in English NPTEL http://nptel.iitm.ac.in Humanities and Social Sciences Pre-requisites: Ability to speak about familiar things in basic sentences in English. Coordinators: Shreesh Chaudhary Humanities & Social SciencesIIT Madras

7 Announce Topic for Presentation : Cycle II :A Civic Problem in My Place

8 Research and Organization of Presentation I : Sources of Information

9 Research and Organization of Presentation II: Tables, Charts, Graphs…

10 Making Power Point Slides and Other Presentation Aid

11 Criteria for (Self) Evaluation of Presentation

12 Student Presentation: Cycle II: A Civic problem in My Place I

13 Student Presentation: Cycle II: A Civic problem in My Place II

14 Feedback on Presentation Cycle II

15 Announce Topic for Cycle III :A Managerial Solution

16 Grammar of Phrasal Pause in English

17 Rhythm in Spoken English :All I want's a room somewhere/ Far away…

18 Rhythm in Spoken English – II

19 Phrasal Pause in Spoken English

20 Phrasal Pause in Spoken English – II : Numbers, Units of Weight, Height… inculcation of values, Role of a teacher and institute climate

Reference Books and Readings

- Chaudhary, Shreesh (1992/2004) Better Spoken English, New Delhi: Vikas Publishing.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	3	3	3	-	-	-	3	1	-	3	3	1	-
CO2	-	3	-	2	1	-	-	3	-	-	-	3	-	-
CO3	-	3	-	2	-	-	-	3	-	-	-	3	-	-
CO4	-	3	3	1	-	1	-	3	-	-	3	3	-	-

Course Title/Code	**Speaking Effectively (MOOC-19E-EDS-101)**	
Course Type	**MOOC**	
L-T-P-O Structure	**0-0-0-0**	
Credits	**2**	
Course Objective	**Student Readiness for Speaking effectively**	
Course Outcomes (COs)		**Mapping**
CO1	**-To read and comprehend the major points discussed in various types art of speaking**	**Employability**
CO2	**-To use Verbal and Non- Verbal encoding.**	**Skill Development**
CO3	**-To build up eye communication and gestures.**	**Entrepreneurship**
CO4	**-To make academic presentations precisely, logically, and effectively.**	**Skill Development**

Section A

Introduction

The Art of Speaking, Encoding Meaning Using Verbal and Nonverbal Symbols, Cross Cultural Communication, Verbal Communication, Encoding Meaning Using Verbal Symbols

Section B

Nonverbal Communication

Encoding Meaning Using Nonverbal Symbols, How to Improve Body Language, Eye Communication, Facial Expression, Dress and Appearance, Posture and Movement, Gesture, Paralanguage

Section C Phonetics

Standard Language and Queen's English, Phonemes of English: Vowels, Phonemes of English: Diphthongs and Consonant, Stress and Rhythm, Intonation

Section D

Voice and Delivery

Voice and Personality, How to Improve Voice, How to Improve Delivery, Pace, Pause, Pitch, Volume, Modulation, Resonance

Reference Books and Readings

1. Chaudhary, Shreesh (1992/2004) Better Spoken English, New Delhi: Vikas Publishing.
2. https://www.researchgate.net/publication/351414669_EFFECTIVE_SPEAKING_AND_EFFECTIVE_LISTENING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	3	3	3	-	-	-	3	1	-	3	3	1	-
CO2	-	3	-	2	1	-	-	3	-	-	-	3	-	-
CO3	-	3	-	2	-	-	-	3	-	-	-	3	-	-
CO4	-	3	3	1	-	1	-	3	-	-	3	3	-	-

Course Title/Code	**Communicative English -II (EDS134)**	
Course Type	**Core**	
Course Nature	**Soft**	
L-T-P-0 Structure	**1-0-2-0**	
Credits	**2**	
Course Objective	**The course aims at developing skills related to Communicative English**	
Course Outcomes (COs)		**Mapping**
CO1	**Demonstrate accuracy in the usage of grammar in their communication**	**Skill development**
CO2	**showcase skills while communicating verbally**	**Skill Development**
CO3	**Display proficiency while using morphology and syntax of English language**	**Skill development**

CO4	**Express themselves accurately in writing**	**Skill development**
Prerequisites (if any)		

Section – A

Lexis & Semantics: Vocabulary Building: The Concept of Word Formation, Root Words from Foreign Languages and their use in English

Sentence: Parts and Kinds, Simple, Compound & Complex Sentences, Use of Phrase & Clause in Sentences.

Section – B

Oral Communication: Importance of Speech Sounds, Organs of Speech, Vowel Sounds, Consonant Sounds, Intonation, Word Stress, Sentence Stress, Listening Comprehension, Conversations & Dialogues

Section – C

Presentation Skills: Communication, Process of Communication, Basic forms of Communication, Barriers & Filters of Communication, Body Language and Paralanguage, Gestures and Postures, Importance of Body Language in Presentation, Hearing and Listening, Essentials of Effective Listening, Importance of Effective Listening,

. **Section – D**

Technical Writing: Nature & Style of Sensible Writing, Techniques of Writing Precisely, Writing Practices: Paragraph & Essay Writing, Paraphrasing, importance of proper punctuation in writing. Job application, resume writing, circular writing, memo writing & blog writing

Suggested Text Book Reading:

CIEFL, Hyderabad. *Exercises in Spoken English Parts I-III*. Oxford University Press.
Koneru, Aruna. *Professional Communication*. McGraw Hills Education Pvt. Ltd.
Kumar, Sanjay and Pushpa Lata. Oxford University Press, 2011. Print.
Lyons, Liz Hamp and Ben Hearsly. Study Writing. Cambridge University Press. 2006. Print.
Swan, Michael. *Practical English Usage*. OUP, 2014. Print.
Wood, F T. Remedial English Grammar. Macmillan, 2007. Print.
Zinsser, William. *On Writing Well*. Harper Resource Book, 2006. Print.

Subramaniam, T. Bala. *A Textbook of English Phonetics for Indian Students*.: Macmillan.
R C Sharma & Krishna Mohan. *Communication.* McGraw Hill Education, Chennai, 2017.
Effective Technical Communication. M Ashraf Rizvi. McGraw Hill Education, Chennai, 2018.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	----	1	1	2	3	1	----	2	----	3	1	3	1	-
CO2	----	1	1	3	3	1	2	1	3	3	1	2	--	3
CO3	----	1	2	3	2	1	2	1	3	3	1	3	1	-
CO4	----	1	2	3	2	1	2	1	3	3	1	2	1	-

Course Title/Code	Critical Understanding of ICT in Education-II (CSW115B)	
Course Type	Workshop	
Course Nature	Core	
L-T-P-O Structure	(0-0-3-0)	
Credits	1.5	
Objective	To assist students in developing the fundamental information and skills they need to function successfully in their daily lives.	
Course Outcomes	Course Mapping	
CO1	To demonstrate the understanding of the main components of the computer hardware and software in use.	Entrepreneurship

CO2	**To integrate technology tools for teaching learning and material development**	**Entrepreneurship**
CO3	**To integrate use of ICT to simplify record keeping, information management in education administration.**	**Employability**
CO4	**To implement various ICTs for project / problem-based constructivist learning environments.**	**Entrepreneurship**

Section A ICT IN EDUCATION

ICT for educational administration: Scheduling, record keeping, student information, electronic grade book, connecting with parents and community.
Electronic Assessment portfolio: concept, types, e-portfolio tools
Online and offline assessment tools: Rubrics, survey tools, reflective journal.
Proprietary and Open-Source Software
Licensing of Software and Content

SECTION B LATEST TRENDS IN ICT

Open Educational Resources (OER)
Concept of Mind mapping
Sharing thoughts and ideas: Blogs, Social networking websites, Discussion forums and mailing lists Virtual Communities: Educational Implications.

Concepts of Robotics

Reference Books and Readings:

1. Bharihok Deepak. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi.
2. Jain Amit; Sharma Samart; & Banerji Saurab (2002). Microsoft PowerPoint. NISCOM, CSIR: New Delhi.
3. Lee, William w., Dianna, L. Owens, (2001) Multimedia based Instructional Design: Computer based training. Jossey-Bass
4. Mishra, S.(Ed.) (2009). STRIDE handbook 08: E-learning. IGNOU: New Delhi.
5. National Policy on ICT in Education. (2010). New Delhi: Department of School Education and Literacy. Ministry of HRD, GOI, Retrieved from: http://mhrd.gov.in/ict_school

6. Roblyer, M.D. (2008). Integrating Educational Technology into Teaching. New Delhi: Pearson Education, South Asia, India.
7. Shiksha Mein Computer (2001). AvaiLable on website of Indira Gandhi National Open University, Delhi: http://www.ignou.ac.in
8. Singh, Kamal Deep. (2012). Lesson through Multimedia. N. Delhi: Arya Book Depot.
9. Singh, Kamal. D., & Kaur, D. (2008). Using Computers in Education. New Delhi: Dhanpat Rai Publishing Company (Pvt.) Limited.
10. Varanasi, L., Sudhakar, V. & Mrunalini, T. (2004). Computer Education. New Delhi: Neelkamal Publications Pvt. Ltd.
11. Walia, J.S. (2008). Foundations of Computer Education and Applications. Punjab: Ahim Paul Publishers.

1. Developing a model based on basic robotics concepts.
2. Developing an electronic teaching portfolio.
3. Combining text, graphic and audio- visuals in developing a digital story.
4. Create an Educational Blog
5. Set up a collaborative wiki
6. Using movie maker prepare a movie on educational theme
7. Create a word search
8. Create crosswords related to pedagogical content for secondary level students. 9. Create a peer networking platform for sharing information and resources 10. Create a mind map on your pedagogical subject.
11. Make a presentation on current trends in Technology and Education
12. Learn to recover the deleted data.
13. Installation of Window's operating system and application software

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	1	3	-	3	2	3	2	-	-	-	-	-	1
CO2	-	1	3	-	3	2	3	1	-	-	-	-	-	1
CO3	-	1	2	-	3	3	1	3	-	3	-	-	-	2

CO4	-	1	1	-	2	1	1	1	-	-	-	-	-	1

Course Title/Code	**Drama and Art Education (EDW125)**
Course Type	**Workshop**
Course Nature	**Core**
L-T-P-0 Structure	**0-0-3-0**
Credits	**1.5**
Course Objective	**Student Readiness for art-based education**

Course Outcomes (COs)		Mapping
CO1	**To develop the skills to use visual art in teaching learning process effectively.**	**Skill Development**
CO2	**To develop the skills to use literary art in teaching learning process effectively.**	**Skill Development**
CO3	**To develop the skills to use performing art in teaching learning process effectively.**	**Entrepreneurship**
CO4	**To develop the skills to integrate technology and art in teaching learning process effectively.**	**Entrepreneurship**
Prerequisites (if any)		

SECTION A THEORETICAL FRAMEWORK

Meaning and concept of Arts and Aesthetics and its significance at secondary level of School Education**,** Role of Art (Visual arts, Literary Arts and performing Arts), Theatre: Introduction, Importance and role of Drama in education, the impact of Music on Human behaviour.

SECTION B

EDUCATIONAL IMPLICATIONS

Need and importance of Art and Drama in Teaching and Learning, Planning lessons based on Art Integrated Learning, Role of teacher as facilitator of learning Arts and Drama, Role Plays and Skits, Ethics of drama practice by students,

Reference Books and Readings:

1. Sahi, J. and Sahi, R. (2008). *Learning through Art*. Eklavya, Bangalore.
2. Chawla, S. S. (1986). *Teaching of Art.* Publication Bureau, Punjabi University, Patiala.
3. Minhas, N. S. (1974). *Art and Education*. N.B.S Educational Publishers, Chandigarh.

NCERT (2006).*Position Paper, National Focus Group on Arts, Music, Dance and Theatre..* Publication department, NCERT

Field activity

Observe an art period in a special school and briefly write your reflections on it

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	1	3	2	1	1	2	1	1	2	-	-	1
CO2	1	2	1	3	2	1	1	2	1	1	2	1	-	2
CO3	1	2	1	3	2	1	1	2	1	1	2	1	-	1
CO4	1	2	1	3	3	1	1	2	1	1	2	-	-	1

Course Title/Code	**Project Report on Field Trip (EDN136)**	
Course Type	**University Compulsory**	
Course Nature	**NTCC**	
L-T-P-0 Structure	**0-0-0-0**	
Credits	**2**	
Course Objective	**Student Readiness for value education**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop skills related to the core competencies like commitment to profession and honouring diversity**	**Employability**

CO2	**To develop skills including communication and problem solving**	**Skill Development**
CO3	**To develop skills like sensitization towards the environment and solving imminent problems**	**Entrepreneurship**
CO4	**To develop skills like team work, co-operation and leadership**	**Skill Development**
Prerequisites (if any)		

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	2	2	-	1	-	1
CO2	2	2	-	-	-	-	-	-	2	2	-	-	2	-
CO3	2	1	-	-	-	-	-	-	2	2	-	-	-	3
CO4	2	2	-	-	-	-	-	-	2	2	-	-	1	-

Course Title/Code	**Post Second Semester Summer Training (EDO165)**	
Course Type	**Outcome**	
L-T-P-0 Structure	**0-0-0-0**	
Credits	**1.5**	
Course Objective	**Student Readiness for value education**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop skills like school sensitization and solving imminent problems**	**Employability**
CO2	**To develop skills like team work, co-operation and leadership**	**Skill Development**
Prerequisites (if any)		

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	3	___	___	___	___	___	___	___	___	___	2	1	___
CO2	1	3	___	___	___	___	___	___	___	___	___	_	3	___

SEMESTER - 3										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/ Workshop/ NTCC)**	**COURSE TYPE (Core/Elective /University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
CHH 237-T	**Organic Chemistry I**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
CHH 237-P	**Organic Chemistry I Lab**				**0**	**0**	**2**	**0**		
PHH 226-T	**Electricity and Electromagnetism**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
PHH 226-P	**Electricity and Electromagnetism Lab**				**0**	**0**	**2**	**0**		
EDH 204-T	**Gymnosperms and Reproduction in Angiosperms**	**EDU**			**3**	**0**	**0**	**0**	**5**	
EDH 204-P	**Gymnosperms and Reproduction in Angiosperms Lab**				**0**	**0**	**2**	**0**		
MAH 248-T	**Real Analysis**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
MAH 248-P	**Real Analysis Lab**				**0**	**0**	**2**	**0**		
EDH 205-T	**Animal Diversity-III and Comparitive Anatomy of Vertebrates**	**EDU**			**3**	**0**	**0**	**0**	**5**	

EDH 205-P	Animal Diversity-III and Comparitive Anatomy of Vertebrates Lab				0	0	2	0		
EDH 221-T	Basics of Biophysics and Instrumentation	EDU	HARD	CORE	3	0	0	0	5	4
EDH 221-P	Basics of Biophysics and Instrumentation Lab				0	0	2	0		
EDH 206-T	Knowledge and Curriculum	EDU	HARD	CORE	3	0	0	0	5	4
EDH 206-P	Knowledge and Curriculum Lab				0	0	2	0		
EDS207	Gender, school and society	EDU	SOFT	CORE	1	0	2	0	3	2
EDW 208	Craft and visual arts	EDU	WORKSHOP	CORE	0	0	3	0	3	2
FLS101	Spanish-I	MRCFL	ELECTIVE	UNIVERSITY COMPULSORY	1	1	0	0	2	0
FLS102	German-I									
FLS103	French-I									
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				17(PCM)/(ZBC)	4(PCM)/ 1(ZBC)	15	0	36(PCM)/33(ZBC)	24

Course Title/Code	Organic Chemistry-I (CHH237-T)
Course Type	Core
Course Nature	Hard

L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**To give an in-depth exposure of Organic Chemistry and familiarize the students with basic concepts of Organic Chemistry**	
Course Outcomes (COs)		**Mapping**
CO1	**To Understand the stereo-chemistry of organic compounds and its applications.**	**Skill Development**
CO2	**To establish a basic concept for structure, properties and reactivity of aliphatic hydrocarbons.**	**Skill Development**
CO3	**To develop a firm foundation for scientific application of aromatic hydrocarbons**	**Skill Development**
CO4	**To apply knowledge to communicate reactions and mechanism in alkyl halides**	**Skill Development**
Prerequisites		

SECTION A STEREOCHEMISTRY OF ORGANIC COMPOUNDS

Review of Concept of Isomerism and Types of isomerism with examples.

Optical Isomerism: Structural changes responsible for properties: elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion
Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Geometric isomerism: Determination of configuration of geometric isomers. Cis – trans and E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism: Difference between configuration and conformation. Conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono alkyl substituted cyclohexane derivatives. Review of Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

SECTION B ALIPHATIC HYDROCARBONS

Alkanes: Review of IUPAC nomenclature of branched and unbranched alkanes. Isomerism in alkanes and industrial source. Methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation), physical properties and chemical reactions of alkanes (halogenation, nitration, sulphonation, oxidation and isomerisation reactions) Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes: Nomenclature, methods of formation (from acetoacetic ester / malonic ester and Dieckmann reaction), chemical reactions (halogenation), Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

Alkenes: Accounting for Reactions due to unsaturation in compounds. Nomenclature of alkenes, methods of formation (by dehydration, dehydrohalogenation and dehalogenation) with mechanism. Regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes.

Cycloalkenes: Methods of formation and chemical reactions of cycloalkenes.

SECTION C AROMATIC HYDROCARBONS

Factors responsible for the characteristic reactions of Aromatic compounds. Nomenclature of benzene derivatives. Structure of benzene : molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity : The Huckel rule, aromatic ions.

Aromatic electrophilic substitution: General pattern of the mechanism, Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/ para ratio. Side chain reactions of benzene derivatives. Birch reduction.

SECTION D ALKYL AND ARYL HALIDES

Alkyl halides: A study of Alkyl halides highlighting its synthetic applications. Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams.

Aryl halides: Methods of formation of aryl halides, nuclear and side chain reactions. The addition- elimination and the eliminationaddition mechanisms of nucleophilic aromatic substitution reactions.

Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	-	-	-		2	1	1	1	2	1	1
CO2	2	1	2	--	--	--	--	2	1	1	1	2	1	1
CO3	1	1	2	--	--	--	--	2	1	1	1	2	1	1
CO4	2	1	2	--	--	--	--	2	1	1		3	1	1

Course Title/Code	**Organic chemistry I Lab (CHH237-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To give an in-depth exposure of Organic Chemistry and familiarize the students with basic concepts of Organic Chemistry**	
Course Outcomes (COs)		**Mapping**
CO1	**To Understand the stereo-chemistry of organic compounds and its applications.**	**Skill Development**
CO2	**To establish a basic concept for structure, properties and reactivity of aliphatic hydrocarbons.**	**Skill Development**
CO3	**To develop a firm foundation for scientific application of aromatic hydrocarbons**	**Skill Development**
CO4	**To apply knowledge to communicate reactions and mechanism in alkyl halides**	**Skill Development**
Prerequisites		

Laboratory Techniques:

1. Calibration of Thermometer using naphthalene / acetanilide / urea
2. Determination of melting point of Benzoic acid / cinnamic acid / m – dinitro benzene / p- dichlorobenzene

3. Distillation of water – alcohol mixture using water condenser; Distillation of chlorobenzene – nitrobenzene mixture using aircondenser
4. Crystallization: Benzoic acid from hot water, naphthalene from ethanol 5. Sublimation of camphor / phthalic acid/succinic acid

Electrophilic Substitution Reactions

1. Preparation of Iodoform from ethanol / acetone
2. Preparation of *m*-dinitrobenzene from nitrobenzene by nitration
3. Preparation of *p*-bromoacetanilide from acetanilide by bromination

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	3	-	-	-	-	3	1	-	2	1	-
CO2	-	2	3	3	-	-	-	-	3	1	-	1	-	3
CO3	-	2	3	3	-	-	-	-	3	1	-	-	2	1
CO4	-	2	3	3	-	-	-	-	3	1	-	1	1	2

Course Title/Code	**Electricity and Electromagnetism (PHH226-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**To enable students to acquire a broad conceptual of electromagnetic phenomena.**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to understand, explain and demonstrate about vector calculus, Gauss law and its application to determine D with problems and diagrams.**	**Skill Development**
CO2	**Students would be able to understand, construction and working of different types of capacitors. Also, they will able to understand polarization phenomenon.**	**Skill Development**
CO3	**Students would be able to understand about Biot Savarts law, Amperes law and different types of forces in magnetostatics.**	**Employability**
CO4	**Students would be able to understand about propagation of electromagnetic waves and electromagnetic induction.**	**Skill Development**

Prerequisites (if any)	**Nil**

SECTION A

ELECTROSTATICS & ELECTRIC CURRENTS

Vector Calculus: Scalar and Vector fields, Gradient of a Scalar, Divergence and Curl of a vector, Line, surface and volume integrals.
Review of Coulomb's law – Electric field and potential – Field due to a monopole,
dipole, torque on a dipole in uniform and non-uniform E fields, Flux of an electric field. Gauss's law, applications to deduce electric fields, P.E. of a system of two charges, of many charges.
Basic circuit analysis – Kirchhoff's laws. Voltage and Current divider Rules. Single loop and two loop circuits, Mesh analysis, RC circuits, Maximum power transfer theorem. (9L)

SECTION B

ELECTRIC FIELDS IN MATTER

Electric Fields: Capacitance, parallel plate capacitor, calculation of capacity ofa spherical and cylindrical capacitor, energy stored in a capacitor, capacitor with dielectric, atomic view of dielectrics, polarization, electric field due to a polarised material, Gauss's law in dielectrics, Dielectric constant, Energy density of an electrostatic field (with and without dielectric).
Polarisability and susceptibility – Frequency dependence of polarisability, Clausius-Mossotti equation. (10L)

SECTION C

MAGNETOSTATICS

Review of Ampere's law, B near a long wire, Magnetic lines of induction, force between two parallel conductors, definition of ampere, B for a solenoid, Biot-Savart's law, applications.

The magnetic field, Lorentz force and definition of magnetic field, magnetic induction, magnetic force on a current element, circulating charges, Cyclotron resonance frequency, Cyclotron. Magnetization, magnetization current density, magnetic field intensity, magnetic susceptibility and permeability. (10L)

SECTION D

ELECTROMAGNETIC INDUCTION

Review of Faraday's law, Faraday's experiment, Lenz's law, Time varying magnetic fields, Application in Betatron. *Inductance:* Self-inductance, LR circuit, energy in a magnetic field, magnetic energy density.
AC circuits: Sinusoidal voltage, current voltage relation in resistance, capacitance and inductance, Reactance and impedance, Power in AC circuits, RMS values, Power factor, LR and CR circuits. Series and parallel LCR circuits. Resonance, mutual inductance and transformers. (11L)

References Books and Readings:

Electricity and Magnetism, Fewkes and Yarwood.
Electricity and Magnetism: A N Matveev, Mir Publishers, Moscow.
Fundamentals of Physics, 6th Edition, David Halliday, Robert Resnick and Jearl Walker, John Wiley, Inc.
Electricity and Magnetism, F.W. Sears, Addison Wesley Co.
Fundamentals of Electricity and Magnetism: A F Kipp, McGraw Hill.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
CO2	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
CO3	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
CO4	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1

Course Title/Code	**Electricity and Electromagnetism Lab (PHH226-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To learn about fundamentals of electricity and magnetism**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to understand, explain and demonstrate about vector calculus, Gauss law and its application to determine with problems and diagrams.**	**Skill Development**
CO2	**Students would be able to understand, construction and working of different types of capacitors. Also, they will able to understand polarization phenomenon.**	**Skill Development**
CO3	**Students would be able to understand about Biot Savarts law, Amperes law and different types of forces in magnetostatics.**	**Skill Development**
CO4	**Students would be able to understand about propagation of electromagnetic waves and electromagnetic induction.**	**Skill Development & Employability**

Prerequisites (if any)	NIL

Electricity and Electromagnetism Practical

To measure resistance and capacitance measurements using multi meter and coding method.
To measure the radius of a coil using Stewart and Gees experiment.
To implement series and parallel combinations of resistance on breadboard.
To verify and design AND, OR, NOT and XOR gates using NAND gates.
To determine the frequency of AC mains using sonometer.
To determine quality factor and resonance of the series and parallel LCR circuit.
To draw output wave of half wave and full wave rectifier.
To draw forward and reverse diode characteristics

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	-	-	2	1	-	-	-	-	1	--	--
CO2	1	1	2	-	-	-	2	-	-	--	-	1	-	-
CO3	1	-	2	--	-	2	1	-	-	-	-	1	-	-
CO4	-	2	3			1	2	--	-	-	-	1	-	-

Course Title/Code	**Gymnosperms and Reproduction in Angiosperms (EDH204-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**(3-0-0-0)**	
Credit	**3**	
Objectives	**After going through this course, the learner will be able to understand the morphology, anatomy, reproduction and classification of Gymnosperms and the structure, development and processes associated with Angiosperm embryology.**	
Course Outcomes (COs)		**Mapping**
CO1	**Understand the General characteristics, classification and economic importance of Gymnosperms**	**Employability**
CO2	**Understand the diverse structural and morphological characteristic features of Angiosperm Flower**	**Skill Development/ Employability**

CO3	**Understand the development of male and female gametophyte**	**Skill Development**
CO4	**Describe Pollination and Fertilization. Different types of Endosperms, Fruit and Seed**	**Skill development**
Prerequisites (if any)	**----------**	

SECTION A

Gymnosperms

General characters, distribution, classification, affinities and economic importance, Study of morphology, anatomy and reproduction in-

Cycadopsida: *Cycas* , Coniferopsida: *Pinus*

Gnetopsida: *Gnetum*

SECTION B

Reproductive structures Angiosperms Flower: Review of structure, morphology, embryological perspective, Microsporangium: Development of wall layers, Tapetal types, microsporogenesis, tetrad types, Male gametophyte: Development and structure; vegetative and generative cells; male gametes,Megasporangium (ovule): Development, types, megasporogenesis, tetrad types.

Female gametophyte: Development, ultrastructure, mono, bi and tetrasporic embryo sacs.

SECTION C

Reproduction in Angiosperms :Pollination and fertilization -Definitions, Types of Pollination, Pollen-Pistil interaction, Self-incompatibility, Double-fertilization ,Endosperm: Definition, Types–Cellular, Nuclear and Helobial; Endosperm haustoria.

SECTION D

Embryo: Classification, types, development of Crucifer type. Fruit and Seed: Development, structure of Monocot and Dicot seeds, dispersal mechanisms, importance,Brief account of Apomixis and Polyembryony.

References Books and Readings:

1. Sporne, K.R. (1974). *Morphology of Gymnosperms*. London: Hutchinson & Co.
2. Gangulee, S.C., Kar, Ashok Kumar. (1982).*College Botany Vol.II*.Calcutta: Central Book Agency.
3. Singh,V., Pande,P.C. &Jain,D.K. (2007). *Diversity and systematics of seed plants.* Meerut:Rastogi Publications.
4. Pandey, S.N., Mishra, S.P. & Trivedi, P.S. (2004). *A Textbook of Botany Vol.II*, Delhi:Vikas Publishing House. 4. Chopra G.L. (1972).*Gymnosperms*.Jullandar: S. Nagin & Co.
5. Bhojwani, S. S. and Bhatnagar, S.P. 000. *The Embryology of Angiosperms*. Delhi: Vikas Publishing House.
6. Raven, P.H., Evert, R.F.and S.E.Eichhorn. (1999).*Biology of Plants, 5th Ed.*, New York: W.H.Freeman and Co., Worth Publishers.
7. Swamy, B.G.L. and Krishnamurthy, K.V.(1980).*From Flower to Fruit*.New Delhi: TMH Publishing House.
8. Johri, B.M.(Ed.).(1984). *Embryology of Angiosperms*. Germany: Springer- Verlag.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	----	-----	----	-----	2	2	1	1	3	1	2
CO2	2	1	1	----	-----	----	-----	2	3	1	1	3	1	1

CO3	2	1	1	----	-----	----	-----	2	1	1	1	3	1	1
CO4	2	1	1	----	-----	----	-----	2	2	1	1	3	1	1

Course Title/Code	**Gymnosperms and Reproduction in Angiosperms Lab (EDH204-P)**

Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**(0-0-2-0)**	
Credits	**1**	
Course Objective	**To observe and identify temporary and permanent slides of Gymnosperms and Angiosperm Embryology.**	
Course Outcomes (COs)		**Mapping**
CO1	**To enable students to identify temporary slides of Gymnosperms and Angiosperm Embryology.**	**Skill Development**

CO2	**To enable students to identify permanent slides of Gymnosperms and Angiosperm Embryology.**	**Skill Development**
CO3	**To develop among students' skills of free hand sectioning, staining and mounting embryological materials.**	**Employability**
CO4	**To describe characteristics of Gymnosperms and Angiosperms on basis of slide studies**	**Employability /Skill Development**
Prerequisites	**------**	
(if any)		

- Observation of disease symptoms in hosts infected by virus, mycoplasma and bacteria.
- Gram staining of bacteria.
- Preparation of bacterial media and culture of bacteria. Study of genera included in theory under Cyanobacteria, algae and fungi by making temporary micropreparations and using permanent slides. Study of crustose, foliose and fruticose lic

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	3	2	2	-	3	--	3
CO2	1	1	2	-	-	-	-	3	3	--	1	3	-	3
CO3	1	1	2	--	-	-	-	3	3	1	1	3	-	3
CO4	1	2	3			-	-	2	2	2	2	1	-	1

Course Title/Code	**Real Analysis (MAH219B-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**4**	
Course Objective	**Students shall be able to apply the Characterization of Real numbers, concepts of Sequences and series of Real numbers and their convergence behavior in solving the mathematical problems.**	
Course Outcomes (COs)		**Mapping**
CO1	**Understand properties of the real line $\mathbb{R}$ and learn to define sequence in terms of functions from $\mathbb{R}$ to a subset of $\mathbb{R}$.**	**Skill Development**
CO2	**Understand properties of topology of real line $\mathbb{R}$ and their application.**	**Skill Development**

CO3	**Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.**	**Skill Development**
CO4	**Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of sets and number system.**	

Section A Real Numbers: The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important subsets of Intervals, Countable and Uncountable sets. Introduction, Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness, Connectedness.

Section B

Sequences: Introduction, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, Subsequences.

Section C

Infinite Series: Introduction, Sequence of partial sums of a series, Convergent series, Cauchy's general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchy's nth root test, D'Alembert's Ratio test, Raabe's test, Integral test, alternating series, Leibniz test, Conditional Convergence, Absolute convergence.

Section D

Riemann Integral: The Upper and lower R-integrals, Integrable (R) functions, Properties of definite and indefinite integral Riemann condition of integrability, Riemann sum, Basic inequality of Riemann integral, algebraic and order properties of the Riemann integral. Riemann integrability for continuous functions, monotonic functions and functions with finite number of discontinuities.

Recommended Books:

Real Analysis by Malik, Wiley Eastern.
Mathematical Analysis by Shanti Narayan, S. Chand and Co. Ltd.
Mathematical Analysis by Malik and Savita Arora, New Age International Pvt. Ltd.
Principles of Mathematical Analysis by Walter Rudin, 2nd Edition, McGraw Hill Book Company, 1984.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	----	1	2	3	----	----	----	2	----	1	3	3	3
CO2	2	----	1	2	3	----	----	----	2	----	1	3	2	2
CO3	2	----	1	2	3	----	----	----	2	----	1	3	3	3
CO4	2	----	1	2	3	----	----	----	2	----	1	2	1	1
CO5	2	----	1	2	3	----	----	----	2	----	1	3	2	2

Course Title/Code	**Real Analysis (MAH219B-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**1-0-0-0**	
Credits	**4**	
Course Objective	**Students shall be able to apply the Characterization of Real numbers, concepts of Sequences and series of Real numbers and their convergence behavior in solving the mathematical problems.**	
Course Outcomes (COs)		**Mapping**
CO1	**Understand properties of the real line $\mathbb{R}$ and learn to define sequence in terms of functions from $\mathbb{R}$ to a subset of $\mathbb{R}$.**	**Skill Development**

CO2	**Understand properties of topology of real line $\mathbb{R}$ and their application**	**Skill Development**
CO3	**Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.**	**Skill Development**
CO4	**Apply the ratio root alternative series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of sets and number system.**	

LAB EXERCISE:

1. Creation and usage of Function files in MATLAB.
2. Inline function with one independent variable and several independent variables.
3. Solution of Application problems using function files.
4. Plotting of recursive sequences.
5. Find a value of that will make the following inequality holds for all >:

(i) $(0.9)<10-3$

(ii) $(2)/n!<10-7$

6. Study the convergence of sequences through plotting.

7. Verify Bolzano Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot.

8. Study the convergence/ divergence of infinite series by plotting their sequences of partial sum.
9. Cauchy's root test by plotting nth roots.

10. Ratio test by plotting the ratio of nth and (n+1)th term.

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	2	----	1	2	3	----	----	----	2	----	1	3	3	3
CO2	2	----	1	2	3	----	----	----	2	----	1	3	2	2
CO3	2	----	1	2	3	----	----	----	2	----	1	3	3	3
CO4	2	----	1	2	3	----	----	----	2	----	1	2	1	1
CO5	2	----	1	2	3	----	----	----	2	----	1	3	2	2

Course Title/Code	**Animal Diversity III and Comparative Anatomy of Vertebrates (EDH205-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-0-0-0**
Credits	**3**
Course Objective	**To enable students to understand in respect of vertebrates; their organizational hierarchies and complexities; the evolutionary trends in external morphology and comparative studies of internal structures; Identification and classification with examples; to enable them to understand various modes of adaptations in animals.**

Course Outcomes (COs)		**Mapping**
CO1	**To understand and analyse characteristics of Pisces**	**Skill Development**
CO2	**To Understand basic characteristics of amphibians and parental care**	**Skill Development**
CO3	**To understand and analyse hierarchy in reptiles and aves**	**Skill Development**
CO4	**. To develop the understanding of evolutionary trends in Mammalia**	**Skill Development**

CO5	**To develop the understanding of heart and aortic arches**	**Entrepreneurship & Skill Development**
CO6	**To understand the structure and evolution of kidneys and gonads in vertebrates**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of animal kingdom**	

SECTION A

PISCES AND AMPHIBIA

a) Pisces: General Characters and Classification of SuperclassPiscesupto classes with examples and comparison of Chondrichthyes and Osteichthyes; Type study: Scoliodon– External morphology, respiratory system, structure of heart and arterial system, structure of brain and lateral line system; Dipnoi, air bladder, migration in fish

b) Amphibia: General characters and classification of class Amphibia, origin of Amphibia, parental care in Amphibia

SECTION B REPTILIA, AVES AND MAMMALIA

Reptilia: General characters and classification of class Reptilia up to orders with examples.

Aves: General characters and classification of class Aves up to orders with examples (5 important orders only), salient features of Archaeornithes and Neornithes, flight adaptation and migration in birds

Mammalia: General characters and classification of class Mammalia up to orders with examples; General characters of Prototheria; Adaptive radiation in Marsupialia and Primates; Adaptive features of Chiropetera and Cetacea; Dentition in mammals

SECTION C

TYPE STUDY – RABBIT AND COMPARATIVE ANATOMY–I

Type study: Oryctolagus (Rabbit) – Respiratory system and structure of brain Sense organs –eye and ear,Comparative studies in amphibians, reptiles, birds and mammals: I) Digestive system and associated glands ii Respiratory organs ,Evolution of heart in vertebrates,Evolution of aortic arches in vertebrates

SECTION D

COMPARATIVE ANATOMY–II

Comparative studies in amphibians, reptiles, birds and mammals:Brain Eye and ear of birds and mammals,Cranial and spinal nerves, Autonomous nervous system,Different types of vertebrae in vertebratesStructure and evolution of kidneys in vertebrates,Structure of gonads and Gono ducts formation

References Books and Readings:

Modern Textbook of Zoology: Vertebrates by R.L. Kotpal – RastogiPublications, Meerut, 3rd edition, 2008.A Text Book of Zoology Vol.II by Parkar and Hasswel – (MacMillan).A Text Book of Zoology Vol.II by R.D.Vidyarthi – (S. Chand & Co., Delhi). 4.Life of Vertebrates by J.Z.Young – (Oxford University Press).The Vertebrate Body by A.S.Romer – (Vakils, Ferrer& Simons, Bombay). 6.Elements of Chordate Anatomy by Weichert – (McGraw Hill).The Birds by R.L Kotpal (4th edition) – (Rastogi Publications, 2008). 8.Bird Migration by D.R. Griffin – (Doubleday, Garden City, USA).

The Book of Indian birds by Salim Ali

Hand Book of the Birds of India & Pakistan by Salim Ali, Ripley, Dillon –(Oxford University Press, Delhi).

Fish and Fisheries by K. Pandey and J.P. Shukla (2nd Edition) (RastogiPublications, 2008). 12.Indian Fishes by Qureshi and Qureshi – (Brij Brothers, Bhopal).

Comparative anatomy of the vertebrates by George C Kent – 3rd saint Louis: The C.V. Mosby Company, 1973.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	-----	3	----	-----	2	1	1	1	3	3	3
CO2	2	1	2	-----	3	----	-----	2	1	1	1	3	3	3
CO3	2	1	2	-----	3	----	-----	2	1	1	1	3	3	3
CO4	2	1	2	-----	3	----	-----	2	1	1	1	3	3	3
CO5	2	1	2	-----	3	--	--	2	1	1	1	3	3	3
CO6	2	1	2	-----	3	-----	-	2	1	1	1	3	3	3

Course Title/Code	**Animal Diversity III and Comparative Anatomy of Vertebrates Lab (EDH205-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection, display and Labelling; of micro techniques (fixing, embedding, section cutting, staining and mounting); of collection, preservation, mounting, identification and labelling of collected specimens; field observation of animals.**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection**	**Skill Development**
CO2	**To develop in the students the skills of display and Labelling; of micro techniques of fixing, embedding, section cutting, staining and mounting**	**Skill Development**
CO3	**To develop in the students the skills of collection, preservation, mounting, identification and labelling of collected specimens**	**Skill Development**

CO4	**To develop in the students the skills of field observation of animals**	**Skill Development & Employability**
Prerequisites (if any)	**-----**	

1. Study of specimens of Chondrichthyes:

a) Zygaena
b) Pristis
d) Trygone) Skate

2. Study of specimens of Osteichthyes:

a) Echeneisb) Clariasc) Hippocampusd) Anguilla
e) Belonef) Synaptura g) Tetradonh) Diodon

3. Mounting of fish scales:

a) Placoid scalesb) Cycloid scales

4. Dissection of Scoliodon(Study of dissected specimens):

a) Afferent and efferent branchial system.
b) Cranial nerves (5th, 7th, 9th and 10th).

5. Study of specimens of Amphibians:

a) Ranab) Bufo c) Hylad) Rhachophorus
e) Salamanderf) Ichthyophisg) Axolotal larva.

6. Study of specimens of Reptilia:

a) Chameleon b) Varanusc) Draco
c) Tortoisee) Crocodile

7. Identification of poisonous and non-poisonous snakes:
a) Cobrab) Kraitc) Rat snake
d) Vipere) Dryophisf) Hydrophis

8. Study of specimens of Aves:
a) Barn owl b) Water hen c) Wood pecker
d) Cattle egret e) Koel f) King fisher
9. Local field visit to identify and classify 10 fauna (common birds and mammals); submission of report.
10. Dissection of rat (demonstration):
a) Digestive system
b) Urinogenital system
c) Arterial system 11. Osteology:
a) Study of skulls of Frog, Varanus/Calotes, Bird and Rabbit.

b) Study of fore and hind limb bones of Frog, Varanus/Calotes, Bird and Rabbit

12. Study of different types of vertebrae:
13. Study of pectoral and pelvic girdles of Frog, Varanus/Calotes, Bird

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	-	-	2	1	-	-	-	-	1	--	--
CO2	1	1	2	-	-	-	2	-	-	--	-	1	-	-
CO3	1	-	2	--	-	2	1	-	-	-	-	1	-	-
CO4	-	2	3	--	--	1	2	--	-	-	-	1	-	-

Course Title/Code	Basics of Biophysics and Instrumentation (EDH221-T)	
Course Type	Core	
L-T-P-0 Structure	(3-0-0-0)	
Credits	3	
Course Objective	To enable the learner to apply the principles of physics and chemistry to understand the biological systems.	
Course Outcomes (COs)		Mapping
CO1	Understand and explain basic concepts of Biophysics.	Skill Development
CO2	Understand and explain the multidisciplinary dimensions of Biophysics.	Employability
CO3	Understand the principles of Biophysics and underlying fundamentals.	Skill Development
CO4	Understand and explain about the various Bio-molecular mechanisms.	Skill Development
CO5	Appreciate the invention of instruments for welfare of human beings and life.	Employability
Prerequisites (if any)		

Section A Introduction to Bio- Physics

Meaning, Nature, Scope, Need and Importance of Biophysics. Dynamic nature of Biophysics and Instrumentation. Fundamental of Biophysics in understanding the dynamics of Bio- Molecules.

Section B

Biophysical properties and Cellular Bio-physics

Surface tension, adsorption, diffusion, osmosis, dialysis and colloids. Molecular alphabets of life Amino acids, nucleic acid bases and lipids. Classification and properties of amino acids, peptides and poly peptides. Nucleosides, nucleotides, polynucleotides, pentose and hexose poly saccharides. Cell membrane and Transport Structure and function of cell membrane. Types of transport across cell membrane. Transport of ions and molecules through cell membranes.

Section C

Fundamentals of Bio-Physics and instrumentation

Basic of Bio-Physics instrumentation system, Functional component in design of biomedical instrumentation systems. Fundamentals of microscopic imaging Physics of light and color, basic concepts in microscopy, anatomy of the microscope, (light microscopy), specialized microscopy techniques- phase contrast and dark field microscopy, simple fluorescence microscopy, confocal microscopy, time lapse fluorescence, fluorescence resonance energy transfer (FRET), Labeling biomolecules for fluorescence microscopy, electron microscopy, interaction of electron beam with samples, scanning and transmission electron microscopy (SEM and TEM).

Section D Principles of x-ray crystallography

Unit cell, cell content, crystal symmetry, crystal systems, Bravais lattices, symmetry elements and operations, point groups and space groups. Bragg's law. Diffraction of x-rays by crystals, atomic scattering factors and structure factors, amplitude and phase.

Text Books References

1. Physical Chemistry for Life Sciences by Barrow C, MC-Grow Hill.
2. Biophysical Chemistry by Bloomfield V A and Harrington R E, W A Freeman and Co.
3. Biophysical Chemistry by Cantor C R and Schimmel, P R, W A Freeman and Co.
4. Protein, by Hasehemyer R N and Hasehemyer ACBV,John Willy and Sons.
5. Aspects of Biophysics, Hughe S W, John Willy andSons.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	3	---	---	---	---	2	---	---	---	3	2	1
CO2	2	1	3	---	---	---	---	2	---	---	---	2	3	1
CO3	2	1	3	---	---	---	---	2	---	---	---	2	2	1
CO4	2	1	3	---	---	---	---	2	---	---	---	2	1	---
CO5	2	1	3	---	---	---	---	2	---	2	3	2	3	3

Course Title/Code	Basics of Biophysics and Instrumentation Lab (EDH221-P)	
Course Type	Core	
L-T-P-0 Structure	(0-0-2-0)	
Credits	1	
Course Objective	To develop skills of using basic biophysical techniques, instrumentation and computer modelling to analyse and understand biomolecules and other biological systems.	
Course Outcomes (COs)		Mapping
CO1	Demonstrate skills used to analyze biomolecules using various biophysical techniques.	Skill Development
CO2	Demonstrate proficiency in using optical microscopes to study biological specimens and slides.	Skill Development
CO3	Demonstrate use of bioinformatic tools to analyse sequence and structure of biomolecules	Employability
Prerequisites (if any)		

LIST OF EXPERIMENTS

1. Analysis of DNA fragments using agarose gel electrophoresis.
2. Separation of pigments present in the leaves (spinach) and flowers (rose, marigold) by paper chromatography and determination of Rf value of components.
3. Study of microscopes: Simple, compound, dissecting and fluorescence. Handling of microscopes.
4. Preparation and study of stained and permanent slides.

Bioinformatics:

5. Exploration of the resources avaiLable in NCBI, PDB, PUBMED etc.
6. Retrieval of a Genbank Entry using an accession number.
7. Retrieval and analysis of a amino acid and gene sequence in FASTA format.
8. Retrieval and analysis of a protein sequence from protein database.
9. Primary and Secondary structure analysis of a protein.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	3	-----	-----	-----	-----	2	2	-----	1	3	1	-
CO2	2	1	3	-----	-----	-----	-----	2	2	-----	1	2	1	-
CO3	2	1	3	-----	-----	-----	-----	2	2	-----	1	3	----	----

Course Title/Code	**Knowledge and Curriculum (EDH206-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P Structure	**(3-0-0-0)**
Credits	**3**
Course Objectives	**The course helps students to identify various dimensions of the curriculum and their relationship with the aims of Education. Also, to help prospective teachers to take decisions about and shape educational and pedagogic practice with greater awareness of the theoretical and conceptual context.**

Course Outcomes (COs)		**Mapping**
CO1	**Explain the concept of knowledge and its relationship with various aspects of curriculum Development**	**Skill Development**
CO2	**Analyse epistemological thoughts of various Indian and western educationists with regard to significant aspects of curriculum**	**Employability**
CO3	**Infer the interrelationship among Education, social forces and curriculum development**	**Skill Development**

CO4	**Assimilate the process of curriculum development with all its significant components**	**Entrepreneurship**
CO5	**Reflect on the role of National Level institutions in curriculum Planning**	**Entrepreneurship**
Prerequisites (if any)	**NA**	

SECTION A

KNOWLEDGE AND EDUCATION

Concept of knowledge, Methods of acquiring knowledge, Different kinds of knowledge, Nature of knowledge, belief, information, skill, perception

Epistemological thoughts of M.K. Gandhi, Rabindranath Tagore, Rousseau, John Dewey, Plato and Paulo Freire in context to activity/ discovery/ dialogue as defined for contemporary education

SECTION B

SOCIAL SYSTEMS AND KNOWLEDGE

Aims of Education and Society, Impact of social structure on concept of knowledge and teaching practices, Role of teacher in knowledge construction, concept of Academic Freedom, Interrelationship of education with culture, secularism, economy, politics, modernization and History

SECTION C

CURRICULUM- BASICS AND DEVELOPMENT

Concept of Curriculum and SylLabus, Core and Hidden Curriculum- Meaning and Role,
Curriculum Development- Basic considerations, Principles, Determinants, Different Approaches of Curriculum Development,
Process of Curriculum Development, Interrelationship between market forces, assessment, and curriculum

SECTION D

CURRICULUM FRAMEWORK AND TRANSACTION

Meaning of Curriculum Framework and Curriculum Transaction**,** Critical analysis of NCF2005 and its recommendations**,** Role of National and State level agencies in framing of the Curriculum- NCERT, SCERT, Boards of Education**,** Role of textbooks in Curriculum transaction**,** Addressing critical issue through Curriculum: Environmental concern, Gender Difference, inclusiveness and value inculcation

Reference Books and Readings:

1. Bawa, M. S. & Nagpal, B. M. eds (2016). *Developing Teaching Competencies*. New Delhi: Viva Books pvt. ltd.
2. Butchvarov, P. (1970). *The Concept of Knowledge*. Evanston, Illinois: North Western University Press.
3. Dewey, J. (1997). *Experience and Education*. Touchstone, New York.
4. Kelly, A. V. (2006). *The Curriculum: Theory and Practice* (Fifth Edition). Sage Publications
5. Krishna, D. (1997). *Gyan Mimansa*. Jaipur: Rajasthan Hindi Granth Academy.
6. NCERT (2005). *National Curriculum Framework*. New Delhi: NCERT.
7. NCERT (2006). *Position Paper, National Focus Group on Curriculum, Syllabus and textbooks*. New Delhi: NCERT.
8. NCERT (2006). *Position Paper, National Focus Group on Systematic Reforms for Curriculum Change.* New Delhi: NCERT.
9. Sarangani, P. (2003). *Construction of School Knowledge*. New Delhi: Sage Publication.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO2
CO1	2	3	2	3	-	1	-----	2	1	2	2	3	3	3
CO2	3	2	2	3	1	2	-	2	1	2	2	3	3	3

CO3	2	3	3	2	-	1	------	2	3	3	3	3	2	1
CO4	1	2	2	3	-	1	2	1	2	2	2	----	-----	----
CO5	1	2	1	1	-	-------	1	1	2	1	2	------	3	3

Course Title/Code	**Knowledge and Curriculum Lab (EDH206-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P Structure	**(0-0-2-0)**
Credits	**1**
Course Objectives	**The course helps students to identify various dimensions of the curriculum and their relationship with the aims of Education. Also, to help prospective teachers to take decisions about and shape educational and pedagogic practice with greater awareness of the theoretical and conceptual context.**

Course Outcomes (COs)		**Mapping**
CO1	**discuss the educational thoughts of great educational thinkers on child centered education**	**Skill Development**
CO2	**Analyse epistemological thoughts of various Indian and western educationists with regard to significant aspects of curriculum**	**Employability**

CO3	**To comprehend curriculum process and practice**	**Skill Development**
Prerequisites (if any)	**NA**	

1. Analyze and make report on the transactional curriculum of any one upper primary and secondary class in any one school subject in light of various considerations of Curriculum Development
2. *Write a report on different methods used by school teacher for construction of knowledge based on survey and observation in school
3. Analyze NCF 2005 with respect to different areas of Curriculum and prepare a presentation on it.
4. Draft out a few activities related to social concerns which can be incorporated in the curriculum transaction.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO2
CO1	2	3	2	3	-	1	-----	2	1	2	2	3	3	3
CO2	3	2	2	3	1	2	-	2	1	2	2	3	3	3
CO3	2	3	3	2	-	1	------	2	3	3	3	3	2	1

Course Title/Code	**Gender, School and Society (EDS207)**

Course Type	**Core**	
Course Nature	**Soft**	
L-T-P-O Structure	**1-0-2-0**	
Credits	**2**	
Course Objective	**To examine the role of school and society in shaping gender identities.**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop a positive notion on sexuality amongst young people.**	**Skill Development**
CO2	**To identify social construction of gender under the lens of class and caste intersectionality.**	**Skill Development**
CO3	**To analyse the role of schools in promoting gender equality through value education.**	**Employability**
CO4	**To develop a strategic approach towards women empowerment with the support of government agencies.**	**Entrepreneurship**

SECTION A PARADIGM SHIFT GENDER ROLES

Concept of gender, difference between gender and sex. Paradigm shift from women studies to gender studies: Brief discussion of landmarks in social reform from Vedic period to 21st century. Patriarchy vs. Matriarchy.

SECTION B SOCIAL CONSTRUCTION OF GENDER

Gender Identity and its theoretical approaches, agencies of gender socialization (family, school, society, media).

Gender roles and stereotypes. Gender and its intersection with Poverty, Caste, Disability and Region (rural, urban and tribal). Protection of children from sexual offences act 2012.

SECTION C GENDER AND SCHOOL

LGBT concepts Gender Bias in School Environment, Gender Bias in Dropouts, Gender Bias in Household responsibilities , Social attitudes towards Girl's Education, Value accorded to Women's Education.

Gender equality- Role of schools in reinforcing gender equality, Role of peers in reinforcing gender equality, Role of teachers in reinforcing gender equality,Role of curriculum and textbook in reinforcing gender equality

SECTION D STRATEGIES FOR CHANGE

Role of media in reinforcing gender parity, The role of family, religion, etc. in reinforcing gender parity. The role of NGOs and women's action groups in striving towards gender equity,The efforts of the government agencies to achieve gender parity:reservations and legal provisions Millenium DevelopmentGoal: Promoting gender equality and empowerment

Reference Books

1. Government of India (1975). *Towards Equality: Report of the committee on the status of Women in India*. Delhi: Department of Social Welfare, Government of India.
2. Kumar, K. (2010). Culture, State and Girls: An Educational Perspective. *Economic and Political Weekly,* XLV(17), p. 24.

Activities:

1. Analysis of folk songs in different languages to identify the myths prevailing in different regions.
2. Poster making: A society with complete gender parity.
3. Short plays with Gender equality as theme.
4. A case study based on Gender bias and intervention given to create awareness.
5. *Covert observation: To observe the distribution of roles and responsibilities among different gender groups in the school and identify their significance in promoting gender bias/ parity.
6. Develop and present a skit that portrays gender inequality (Group activity).
7. Choose any one woman achiever from an unconventional field and analyze the various gender biases she would have overcome to achieve her goals.

Reference Books:

1. Bordia,A. (2007). *Education for gender equity.* The Lok Jumbish experience, p. 313-329.
2. Chatterji,S.A. (1993). *The Indian Women in Perspective.* New Delhi: Vikas Publishing.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	3	3	3	3	3	1	-	2
CO2	3	2	3	1	2	2	1	2	3	1	2	2	2	-
CO3	1	3	2	2	1	3	2	1	3	2	3	2	1	1
CO4	1	1	3	2	1	2	2	1	3	2	3	3	-	-

Course Title/Code	**Craft and Visual Arts (EDW208)**	
Course Type	**Core**	
Course Nature	**Workshop**	
L-T-P-0 Structure	**0-0-3-0**	
Credits	**1.5**	
Course Objective	**Demonstrate an understanding of the relationships between the arts and other disciplines.**	
Course Outcomes (COs)		**Mapping**

CO1	**To demonstrate awareness and understanding of craft and visual art forms**	**Employability**
CO2	**To demonstrate skill at integrating craft and visual art for effective teaching**	**Skill Development**
CO3	**To demonstrate aesthetic sensibility to respond through expression**	**Skill Development**
CO4	**To demonstrate imagination through participation in craft and visual art activities**	**Skill Development**

SECTION A

Meaning and concept of Crafts and Visual Arts, various forms of Crafts and Visual Arts and their significance at secondary level of school education, relationship of arts and craft with aesthetics, identification and experimentation with different forms of crafts and visual arts

SECTION B

APPLICATION OF CRAFTS AND VISUAL ARTS IN EDUCATION

Knowledge of Indian art and craft tradition and its relevance in education, Exploring crafts and visual arts in education as pedagogy across school curriculum, planning lessons with systematic classroom integration, Role of teacher in visual art and craft in integrated learning in the form of Sketching, Quilling, Calligraphy, Mask Making etc.

Craft and Visual Arts Practical (EDW208)

 Monotype surface painting: thread painting, vegetable painting, stamp painting, block painting, spray print

 Making a Digital story on emerging social issue by making use of software, apps and other technological tools

 Preparation of two teaching learning materials; Charts, Models, Flash Cards, Flip books etc

 Mindfulness based activity - Portrayal of the 'Self concept'/ 'Future Me' in the form of mind map through different symbols, colors, shades and designs

 Recycling activity (Making usable papers through paper waste)

 Paper folding activity; Folders, paper bags, lanterns and Greeting Cards

 Candle making activity

 Decorating Activity - Pottery and Diyas

 Glass painting

 Quill art and flower making activity

 Paper Sculpture, Paper craft, and Paper Mache

 Jumping Clay, Calligraphy and Mask Making

 Creating Best out waste

 Making an E-portfolio in the form of digital compilation and documentation of all art and craft activities undertaken

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	--	--	2	--	--	--	--	--	2	2	1	2	-

CO2	2	---	---	---	2	2	---	---	---	2	2	1	1	2
CO3	2	2	--	2	2	2	---	1	--	2	2	1	-	2
CO4	2	--	--	--	2	1	---	1	---	2	2	-	3	-

Course Title/Code	**Spanish-I (FLS101)**	
Course Type	**University Compulsory**	
Course Nature	**Elective**	
L-T-P-0 Structure	**1-1-0-0**	
Credits	**0**	
Course Objective	**Demonstrate advanced proficiency in spoken and written Spanish**	
Course Outcomes (COs)		**Mapping**
CO1	**Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.**	**Skill Development**

CO2	**Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes.**	**Skill Development**
CO3	**Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.**	**Skill Development**
CO4	**Students will be able to understand audio text and comprehend to the same. They will be able to form paragraph using auxiliary verb and basic verbs.**	**Skill Development**
CO5	**Students will be introduced to French culture and civilization. They will be able to describe various places and locations of Francophonic countries.**	**Skill Development**

SECTION A

Introduction to Spanish and SER

1.1 Presentation on Spanish language

1.2 Greetings and goodbyes

1.3 Spanish letters

1.4 Introduction of verboSER

SECTION B

Verb Ser, Nationality, Profession and Counting

2.1 Uses of verbo SER

2.2 Adjectives related to verbo SER.

2.3 Introduction of Nationality
2.4 Professions and vocabulary related to professions.

2.5 Counting till number 20.

SECTION C

Articles, Interrogative and Estar

3.1 Introduction of Articles and Indefinite articles

3.2 Interrogatives

3.3 Introduction of VerboEstar

SECTION D

Estar, Preposition, Tener and Self Introduction

4.1 Uses of Verbo ESTAR and adjectives related to it

4.2 Introducton of ‘my house’ vocabulary

4.3 Prepositions related to the positioning of an object

4.4 Self – introduction

Day, Month and Regular AR verb

5.1 Days

5.2 Months

5.3 Introduction to regular –AR verbs

Text Books/Reference Books:

1. ¡Ole!-Langers
2. ¡Uno, dos, tres……

Weblinks:

http://studyspanish.com/ **Assessment**

Tools:

Sessional tests
Term end examination scores
Participation in class activities
Home assignments
Class attendance

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	-	-	-	-	-	-	-	-	1	2	-
CO2	2	3	3	-	-	-	-	-	-	-	-	1	1	-
CO3	1	3	3	-	-	-	-	2	1	-	-	1	-	2
CO4	1	1	2	-	-	-	-	3	1	-	-	-	3	-
CO5	1	1	3	-	-	-	-	3	2	-	-	-	-	-

Course Title/Code	**German-I (FLS102)**
Course Type	**University Compulsory**
Course Nature	**Elective**
L-T-P-0 Structure	**1-1-0-0**
Credits	**0**
Course Objective	**Demonstrate awareness of cultural and historical differences between the culture of German-speaking countries and the student's native culture.**

Course Outcomes (COs)		Mapping
CO1	**Students will be able to exchange greetings and introductions using formal and informal expressions. They will be able to ask and answer simple questions.**	**Skill Development**
CO2	**Students will be able to discuss everyday life and daily routines, using simple sentences and familiar vocabulary.**	**Skill Development**
CO3	**Students will be able to identify key details in short, highly-contextualized audio text dealing with a familiar topic, relying on repetition and extra linguistic support when needed. Students will be able to discuss likes and dislikes, understand simple conversations about familiar topics (e.g., greetings, weather, sports, hobbies and daily activities,) with repetition when needed.**	**Skill Development**
CO4	**Students will be able to differentiate certain patterns of behavior in the cultures of the German-speaking world and the student's native culture. Students will be able to describe various places, location, themselves using simple sentences and vocabulary.**	**Skill Development**

SECTION-A

Unit-1: Begrüßungen

1.1 Salutations/Greetings

1.2 Introduction

Unit-2: sichvorstellen und Zahlen

2.1 Introduction

2.2 Alphabets

2.3 Numbers 1-20

SECTION-B

Unit-3: Berufe/ Pronomen

3.1 Personal pronouns

3.2 Hobbies and professions

SECTION-C

Unit-4:Café

4.1 Café related vocabulary and dialogues

4.2 Revision personal pronouns

Unit-5: Café dialog

5.1 Café related vocabulary and dialogues

5.2 Common verbs and their conjugations

SECTION-D

Unit-6: Zeit und Monate

6.1 Time

6.2 Days

6.3 Months

Text Books/Reference Books:

1. Studio D A1, Hermann Funk, 2011, Cornelson Publication
2. TangaramAktuell A1, Kursbuch&Arbeitsbuch, 2011, Hueber
3. Netzwerk, Stefanie Dengler, Paul Ruschet. Al, 2011, Klett

Weblinks:

http://www.nthuleen.com/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	3	3	-	-	-	-	2	1	-	-	-	-	2
CO2	-	3	2	3	-	-	-	-	-	1	-	-	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-	-	1
CO4	2	3	3	-	-	-	-	-	-	-	-	-	-	1

Course Title/Code	**French-I (FLS103)**	
Course Type	**University Compulsory**	
Course Nature	**Elective**	
L-T-P-0 Structure	**1-1-0-0**	
Credits	**0**	
Course Objective	**Demonstrate advanced proficiency in spoken and written French**	
Course Outcomes (COs)		**Mapping**
CO1	**Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.**	**Skill Development**

CO2	**Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes.**	**Skill Development**
CO3	**Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.**	**Skill Development**
CO4	**Students will be able to understand audio text and comprehend to the same. They will be able to form paragraph using auxiliary verb and basic verbs.**	**Skill Development**
CO5	**Students will be introduced to French culture and civilization. They will be able to describe various places and locations of Francophonic countries.**	**Skill Development**

SECTION-A

Unit - Saluerетépelerl'alphabet

1.1 Les Salutations & forms of politeness

1.2 Alphabets

Unit 2- Usage de Vouset de Tu

2.1 Taking leave expressions

2.2 Les pronomssujets

2.3 Basic Questions

SECTION-B

Unit 3- Présentez-vous

3.1 Les verbes ER

3.2 Self introduction

3.3 Décrivezvotreami(e)

SECTION-C

Unit 4- Identifier unnombre, compter

4.1 Les nomS.2 VerbesAvoir, Etre, Aller& Faire

4.3 Lesnombres

Unit 5- Demander/ donnerl'explications

5.1 Les articles define etindefini

5.2 Les mois de l'annee

5.3 Lesjours de la semaine

SECTION-D

Unit 6- Parler des saisonset demander l'heure

6.1 Time

6.2 Weather

6.3 Unseen Passage

Text Books/Reference Books/ Suggested Readings:

1. Alter Ego Level One Textbook, Annie Berthet, Catherine Hugot, Hachette Publications
2. Apprenons Le Francais II & III,MahithaRanjit, 2017, Saraswati Publications Weblinks:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	-	-	-	-	-	-	-	-	-	-	1
CO2	2	3	3	-	-	-	-	-	-	-	-	-	-	1
CO3	1	3	3	-	-	-	-	2	1	-	-	-	-	2
CO4	1	1	2	-	-	-	-	3	1	-	-	-	-	1
CO5	1	1	3	-	-	-	-	3	2	-	-	-	-	3

SEMESTER - 4										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/Workshop/ NTCC)**	**COURSE TYPE (Core/ Elective /University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
CHH 238-T	**Thermodynamics, Equilibrium and Solutions**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
CHH 238-P	**Thermodynamics, Equilibrium and Solutions Lab**				**0**	**0**	**2**	**0**		
CHH 313-T	**Organic Chemistry II**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
CHH 313-P	**Organic Chemistry II Lab**				**0**	**0**	**2**	**0**		
PHH 227-T	**Optics**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
PHH 227-P	**Optic sLab**				**0**	**0**	**2**	**0**		
EDH 224-T	**Angiosperm Anatomy; Ecology and Evolution**	**EDU**			**3**	**0**	**0**	**0**	**5**	
EDH 224-P	**Angiosperm Anatomy; Ecology and Evolution Lab**				**0**	**0**	**2**	**0**		

MAH 249 T	Differential Equation	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH 249 T	Differential Equation Lab				0	0	2	0		
EDH 225-T	Animal Physiology and Endocrinology	EDU			3	0	0	0	5	
EDH 225-P	Animal Physiology and Endocrinology Lab				0	0	2	0		
EDH 122-T	Assessment For Learning	EDU	HARD	CORE	3	0	0	0	5	4
EDH 122-P	Assessment For Learning Lab				0	0	2	0		
EDS227	School Organization & Management	EDU	SOFT	CORE	1	0	2	0	3	2
EDW 228	e-learning	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
201MOOC-18EEDN-201	Design Thinking- A Primer	EDU	MOOC	CORE	0	0	0	3	3	1.5
EDN 229	Street Play/ Skit/ Mime		Workshop	CORE	1	0	2	0		
MOOC19EEDS-204	Principles of Human Resource Management	MGT	MOOC	CORE	0	0	0	3	3	2

MCS 231/232	Basics of Economics/ Introduction to Finance		SOFT	Elective	1	0	2	0		
FLS105	Spanish-II	MRCFL	ELECTIVE	UNIVERSITY COMPULSORY	1	1	0	0	2	0
FLS106	German-II									
FLS107	French-II									

	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)	19(PCM)/(ZBC)	5(PCM)/2(ZBC)	19(PCM)/(ZBC)	6(PCM/ZBC)	49 (PCM)/46 (ZBC)	27

(EDO239) Two weeks Community Connect internship (1.5 credits)

Course Title/Code	**Thermodynamics, Equilibrium & Solutions CHH238-T**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-O Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**To make student able to understand the practical aspects of kinetics of the reactions & different potentiometric titrations**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop an understanding of the chemistry heat of neutralization of acids and bases**	**Skill Development**
CO2	**To develop basic skills for Verification of Hess's law of constant heat summation**	**Skill Development**
CO3	**Learn Determination of dissociation constant of a weak acid in Physical chemistry Laboratory**	**Employability**
CO4	**Perform determination of dissociation constant of phenolphthalein/methyl orange by colorimeter**	**Skill Development**
Prerequisites	**Nil**	

SECTION A

Concept of Energy, Historical perspectives, Generalization of laws of Thermodynamics based on human experience with Nature and natural Processes. Language of thermodynamics: system, surroundings, etc. Types of system, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule, Joule– Thomson coefficient and inversion temperature. Calculation of w.q. dU and dT for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry: Standard state, standard enthalpy of formation. Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. **(10 L)**

SECTION B

To unify the equilibrium properties of simple mixtures on the basis of chemical potential. Solutions of Gases in liquids. Henry's law and its applications, solutions of solids in liquids. Distribution law, application of distribution law to association, dissociation and extraction. To unify the equilibrium properties of simple mixtures on the basis of chemical potential.Solutions of Gases in liquids. Henry's law and its applications, solutions of solids in liquids.Distribution law, application of distribution law to association, dissociation and extraction.

SECTION C SOLUTIONS

Dilute Solution: Colligative properties, Osmosis, Osmotic pressure, Vant Hoff Theory, Lowering of Vapour Pressure, Depression in Freezing point and Elevation in Boiling Point, Vant Hoff Factor.

Liquid – liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system – Azeotropes

– HC – H2O and ethanol – water systems.

Partially miscible liquids – Phenol-water, trimethylamine – water, nicotine – water systems.

SECTION D

To unify the equilibrium properties of simple mixtures on the basis of chemical potential. Solutions of Gases in liquids. Henry's law and its applications, solutions of solids in liquids. Distribution law, application of distribution law to association, dissociation and extraction.

Dilute Solution: Colligative properties, Osmosis, Osmotic pressure, Vant Hoff Theory, Lowering of Vapour Pressure, Depression in Freezing point and Elevation in Boiling Point, Vant Hoff Factor.

Liquid – liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system – Azeotropes – HC – H_2O and ethanol – water systems.

Partially miscible liquids – Phenol-water, trimethylamine – water, nicotine – water systems.

Reference Books and Readings:

1. University Chemistry : Bruce Mahan
2. Concise Inorganic Chemistry : J D Lee
3. An Introduction to Inorganic Chemistry : Mackay and Mackay
4. Concise Inorganic Chemistry : J D Lee
5. An Introduction to Inorganic Chemistry : Mackay and Mackay
6. Principles of Physical Chemistry : Marron and Prutton
7. Elements of Physical Chemistry : Samuel Glasstone and Lewis
8. Physical Chemistry : P W Atkins

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	-	1	-	1	-
CO2	1	1	2	-	-	2	-	-	-	-	1	-	1	-
CO3	1	1	-	-	1	-	-	-	1	-	1	-	1	-
CO4	1	1	1	-	3	1	-	-	1	-	1	-	1	-

Course Title/Code	**Thermodynamics, Equilibrium & Solutions CHH238-P**
Course Type	**Core**
L-T-P-O Structure	**0-0-2-0**
Credits	**1**

Course Objective	To make student able to understand the practical aspects of kinetics of the reactions & different potentiometric titrations	
Course Outcomes (COs)		Mapping
CO1	To understand that conservation of energy is the central concept which governs all the changes and to appreciate its role in various thermo chemical equations.	Skill Development
CO2	Explain the origin of the driving force of physical and chemical changes and evolution of second law of thermodynamics and related concepts	Skill Development
CO3	To apply the concept of equilibrium to construct and interpret the phase diagrams.	Employability
CO4	To relate the measurement of colligative properties with molar mass to analyze van't Hoff factor for association and dissociation of nonvolatile solutes in solutions	Skill Development
Prerequisites	Nil	

1. Determination of heat of neutralization of acids and bases.
2. Verification of Hess's law of constant heat summation.
3. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
4. pH titration of acid versus base (observation of change in pH).
5. Construction of phase diagram for a two-component system. (Solid-solid, liquid-liquid).
6. Determination of equivalent constant of hydrolyses of an ester.
7. Determination of dissociation constant of a weak acid.
8. A comparative study on methods of finding pH using universal indicator, pH paper strips (both wide and narrow range), pH meter.
9. Determination of solubility product constant (Ksp) of a sparingly soluble salt.
10. Determination of dissociation constant of phenol phthalein/methyl orange by colorimeter.

References:

A Text Book of Qualitative organic Analysis, A I Vogel

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	-	1	-	-	-	-	-	-	-	1	-	1	-
CO2	1	-	2	-	-	2	-	-	-	-	1	-	1	-
CO3	1	-	-	-	1	-	-	-	1	-	1	-	1	-
CO4	1	-	1	-	3	1	-	-	1	-	1	-	1	-

Course Title/Code	**Organic Chemistry-II (CHH313-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**To give an in-depth exposure of Organic Chemistry and familiarize the students with advance concepts of Organic Chemistry**	
Course Outcomes (COs)		**Mapping**

CO1	**To develop an understanding of the chemistry of Functional groups and mechanisms of Organic Reactions.**	**Skill Development**
CO2	**To develop basic skills of separation of organic compounds and evolve a scheme of analysis of organic compounds based on properties of functional groups for identification**	**Skill Development**
CO3	**Learn the properties, synthesis and chemical reactions of halogen and/or oxygen containing functional groups in organic chemistry**	**Skill Development**
CO4	**Perform inter-conversions of various functional groups in organic chemistry.**	**Skill Development**
Prerequisites		

SECTION A

ALCOHOLS AND PHENOLS

Monohydric alcohols: Nomenclature, methods of formation (reduction of aldehydes, ketones, carboxylic acids and esters). Hydrogen bonding, Acidic nature. Reactions of alcohols (oxidation, esterification, dehydration).

Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols - oxidative cleavage [$Pb(OA_c)_4$ and HIO_4] and Pinacol-pinacolone rearrangement.

Trihydric alcohols: Nomenclature and methods of formation (from alkenes and alkenals), chemical reactions of glycerol (with nitric acid, oxalic acid and HI). Phenols: Nomenclature, structure and bonding, Preparation of phenol, resorcinol and 1 and 2- naphthols (one method each). Physical properties and acidic character of phenol. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols: Electrophilic aromatic substitution, acylation and carboxylation.

(10 L)

SECTION B

CARBONYL COMPOUNDS ALDEHYDES AND KETONES

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Use of acetals as protecting group. Baeyer-Villager oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. **(8 L)**

.

SECTION C ORGANIC SYNTHESIS VIA CARBANIONS

Synthesis of ethyl acetoacetate by Claisen condensation and diethyl malonate. Acidity of α – hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids – succinic acid and adipic acid; α,β – unsaturated acids – crotonic acid and cinnamic acid; barbituric acid.

Synthetic applications of acetoacetic ester: dicarboxylic acids – succinic acid and adipic acid; α, β – unsaturated acids – crotonic acid and cinnamic acid; antipyrine, uracil and acetyl acetone. keto-enol tautomerism of ethyl acetoacetate. **(8 L)**

SECTION D ORGANIC COMPOUNDS OF NITROGEN

Nitro Compounds: Introduction, Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Aliphatic and Aromatic amines: Structure and nomenclature of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrites), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactivity, physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines (Hinsberg's method). Structural features effecting basicity of amines. Amine salts as phase – transfer catalysts. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations by aryl diazonium salts, azo coupling.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	2	2	1	1	--	1	--	--	--	3	2	1
CO2	1	2	2	2	2	1	--	1	--	--	--	2	2	1
CO3	1	2	2	1	2	1	--	1	--	--	--	1	2	1
CO4	1	2	2	2	2	1	--	1	--	--	--	1	1	1

Course Title/Code	Organic Chemistry-II Lab (CHH313-P)	
Course Type	Core	
L-T-P-0 Structure	0-0-2-0	
Credits	1	
Course Objective	To give an in-depth exposure of Organic Chemistry and familiarize the students with advance concepts of Organic Chemistry	
Course Outcomes (COs)		Mapping
CO1	To develop an understanding of the chemistry of Functional groups and mechanisms of Organic Reactions.	Skill Development
CO2	To develop basic skills for the analysis of organic compounds based on properties of functional groups for identification	Skill Development
CO3	Learn the properties, synthesis and chemical reactions of halogen and/or oxygen containing functional groups in organic chemistry Laboratory	Skill Development
CO4	Perform inter-conversions of various functional groups experimentally	Skill Development
Prerequisites		

Experiments

List of practicals:

1. Qualitative organic analysis:

(i) Separation of organic mixtures containing two solid components using water , $NaHCO_3$, NaOH

(ii) Analysis of an organic compound: Detection of extra elements (N,S and X) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, alcohols, amines, amides, nitro and anilides) in simple organic

compounds. Identification of organic compound based on functional group analysis, determination of physical constant (mp / bp).

2. Separation of green leaf pigments (spinach leaves may be used) by chromatography. 3. Preparation and separation of 2,4-dinitrophenylhydrazones of acetone / 2-butanone using toluene : light petroleum (2:3 ratio) by chromatography.

4. Separation of mixture of dyes by chromatography.

5. Separation of mixture of amino acids by chromatography.

6. Separation of mixture of D-galactose and D-fructose using n-butanol:acetic acid:water (4:5:1) ; Spray reagent: anilinehydrogenphthalate.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	-	-	3	1	-	-	2	3
CO2	2	2	3	3	-	-	-	-	3	1	-	-	2	3
CO3	2	2	3	3	-	-	-	-	3	1	-	-	2	3
CO4	2	2	3	3	-	-	-	-	3	1	-	-	2	3

Course Title/Code	**Optics (PHH227-T)**

Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**To enable students to understand that light is a wave phenomenon and to apply the understanding of wave phenomenon to light.**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to understand about interference of light.**	**Skill Development**
CO2	**Students would be able to understand about diffraction of light.**	**Skill Development**
CO3	**Students would be able to understand about polarisation of light.**	**Employability**
CO4	**Students would be able to understand about LASER and Optical fiber.**	**Skill Development**
Prerequisites (if any)	**Nil**	

SYLLABUS

Section A: WAVE NATURE OF LIGHT AND INTERFERENCE Light-electromagnetic spectrum, Rotating mirror method of determination of speed of light, Huygen's principle, explanation of reflection and refraction, Fermat's Principle, Phase change on reflection, total internal reflection. Young's experiment - coherence, intensity distribution and visibility of fringes, Newton's rings, Fresnel's Biprism, interference in thin films, colours of thin films, interference at an air wedge, Michelson's interferometer.

Section B: DIFFRACTION

Fraunhofer and Fresnel: Diffraction, Diffraction at a single slit, double slit, Diffraction by multiple slits, Diffraction grating, Resolving power – Rayleigh's criterion, Resolving power of a grating and telescope. Fresnel diffraction, half period zone, zone plate, diffraction at a circular aperture and at a straight edge (qualitative treatment only).

Section C: POLARISATION

Polarization by reflection, Brewster's law, Malus law, Double refraction, Production and detection of linearly, circularly and elliptically polarized light, Quarter and half wave plates, Polariods, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity

Section D: SCATTERING OF LIGHT AND LASERS

Laser and fibre optics

Laser: Stimulated absorption, Spontaneous and stimulated emission, Population inversion, Conditions for laser action, Types of laser: He-Ne laser, Ruby Laser. Dye laser, Semiconductor laser. Laser properties and laser applications

Fiber Optics: Introduction, Propagation of light through a fiber, Numerical aperture, Types of fiber, Modes of propagation (simple idea), V-number, applications of optical fibers.

References Books and Readings:

b)Textbook of Optics, Brijlal and Subramaniam
c)Optics, A K Ghatak.

d)Fundamentals of Optics, Jenkins and White.
e)Fundamentals of Optics, Khanna and Gulati.
f) Engineering Physics by S.L. Gupta

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	-----	1	-------	------	2	-----	-----	-----	-----	1	-----
CO2	2	1	2	-----	1	-------	------	2	1	1	1	3	1	1
CO3	2	1	2	1	------	1	------	2	1	-----	1	3	-----	1
CO4	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1

Course Title/Code	**Optics Lab (PHH227-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To develop in students the skills of understanding the phenomenon of light**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to understand about interference of light.**	**Skill Development**
CO2	**Students would be able to understand about diffraction of light.**	**Skill Development**
CO3	**Students would be able to understand about polarisation of light.**	**Skill Development**
CO4	**Students would be able to understand about LASER and Optical fiber.**	**Skill Development & Employability**
Prerequisites (if any)	**-----**	

List of Experiments:

1. To determine the wavelength of sodium light by Newton's rings experiment.
2. To determine the wavelength of sodium light by Fresnel's biprism experiment.
3. To determine the wavelength of various colors of white light with the help of a plane transmission diffraction grating.
4. Determination of dispersive power of the given grating.
5. To determine the refractive index and Cauchy's constants of a prism by using spectrometer.
6. To determine the wavelength of sodium light by Michelson interferometer.
7. To determine the resolving power of a telescope.
8. To determine the pitch of a screw using He-Ne laser
9. To determine the specific rotation of optically active solution by using Laurent's half shade polarimeter.
10. To determine the numerical aperture of an optical fiber using laser light.

References:

1. Advanced Practical Physics- B. L. Worsnop and Flint.
2. Practical Physics- S. L. Gupta and V. Kumar
3. B. Sc. Practical Physics- Harnam Singh and P. S. Hemine
4. Advanced Practical Physics- Chauhan and Singh

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	2	1	-	-	-	-	1	--	--
CO2	1	1	2	-	-	-	2	-	-	--	-	1	-	-
CO3	1	-	2	--	-	2	1	-	-	-	-	1	-	-
CO4	2	2	3	-	-	1	2	--	-	-	-	1	-	-

Course Title/Code	**Angiosperm Anatomy, Evolution and Economic Botany (EDH224-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**This course aims to add to understanding of the students about the diversity of plants, their description, identification, nomenclature and their classification including recent advances in the field.**	
Course Outcomes (COs)		**Mapping**
CO1	**Understand the development, organization, and functions of various plant tissues in angiosperms.**	**Skill Development**
CO2	**Understand the diversity of histological complexity in Angiosperms.**	**Skill Development**
CO3	**Understand evolution, brief account of origin of life and economic importance of plants.**	**Employability & Entrepreneurship**
CO4	**Understand the secondary growth in root and stem.**	**Skill Development**
Prerequisites (if any)	**Basic understanding of Plant Anatomy and Evolution**	

SECTION A

Angiosperm Anatomy

Meristems: Characteristics, Classification, Theories of meristematic activity, Organization of shoot-apex
Epidermis: Structure and function, Stomatal types, Trichomes.
Simple tissues: Definition, Types (parenchyma, collenchyma, sclerenchyma), Structure, Function
Vascular tissues: Xylem and Phloem-Structure, function, primary and secondary vascular tissues, Types of wood

SECTION B

Review of anatomy of stem, root and leaf in Dicots Review
of anatomy of stem, root and leaf in Monocots.
Secondary growth in root and stem.
Brief account of Anomalous secondary growth– *Bougainvillea*, *Dracaena*.

SECTION C

Evolution:

Brief account of origin of life.
Concept of evolution.
Evolutionary theories – Lamarckism, Darwinism, Germ plasm and Mutation theories. Neo-Darwinism,
Isolation, Mutation, Speciation, Genetic drifts.

SECTION D

Economic Botany

Brief account (botanical name, family, extraction/ processing where necessary) and uses of the following:

Cereals and Pulses: Rice, wheat, maize, millets, pigeon, pea, bengal gram, green gram, black gram.

Fibers: Cotton, jute, linen, coir.
Vegetable oils: Groundnut, coconut, sunflower, safflower, castor.
Timber and bamboos: Rosewood, teakwood, canes and bamboos.
Beverages: General account, coffee, tea, cocoa.
Spices and condiments: General account, cardamom, clove, pepper, ginger, cinnamon, saffron, turmeric, mustard. **Rubber:** General account, Hevea, Ficus.
Medicinal plants: Brief account of ethnobotany, uses of Cinchona, Rauwolfia, Phyllanthes, Catharanthus, Ocimum, Tylophora and other locally avaiLable medicinal plants.

References Books and Readings:

- Esau, K. (1977). *Anatomy of Seed Plants, 2nd Ed*. New York: John Wiley & Sons.
- Fahn, A. (1974). *Plant Anatomy 2nd Ed.* Oxford: Pergamon Press.
- Mouseth J.D. (1988). *Plant Anatomy*. California: The Benjamin Cummings Publishing Co. Inc.
- Singh, V., Pande, P.C. & Jain, D.K. (2007). *A textbook of Botany Angiosperms.* Meerut: Jullandar: Rastogi Publications.
- Vashishta, P.C. *A Text book of Plant Anatomy*. Pradeep Publications,
- Gangulee S.C. &Kar, A.K. (1980). *College Botany Vol.I*, Calcutta: Central Book Agency.
- Sharma, P.D. (2006). *Environmental biology*. Meerut: Rastogi Publications.
- Mitra, J.N. *An Introduction to Systematic Botany and Ecology*. Calcutta: World Press.
- Odum, E.P. (1983). *Basic Ecology*. Philadelphia: Saunders.
- Kormondy, E.J. (1996). *Concepts of Ecology*. New Delhi: Viva Books Pvt. Ltd.
- Moore P.W. and Chapman, S.B. (1986). *Methods in Plant Ecology*. Blackwell Scientific Publications.
- Krebs, C.J. (1989). *Ecological Methodology*. New York: Harper and Row.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	----	2	----	----	----	----	1	2	1	1	3	1	1
CO2	1	----	2	----	----	----	----	1	2	1	1	3	1	1
CO3	1	----	2	----	----	----	----	1	2	1	1	3	1	1
CO4	1	----	2	----	----	----	----	1	2	1	_	2	3	1

Course Title/Code	**Angiosperm Anatomy, Evolution and Economic Botany (EDH224-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**The course gives an understanding about the systematic position of Generas, Species and Families, and knowledge about plant nomenclature.**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop the skill of free hand sectioning, staining and mounting of plant parts for anatomical study.**	**Skill Development**
CO2	**To observe and identify different types of tissues using temporary and permanent slides.**	**Employability**
CO3	**To study the anomalous secondary growth of Bougainvillea.**	**Skill Development**

CO4	**To give a brief account (botanical name, family, extraction/ processing where necessary) and uses of various economically beneficial plants.**	**Entrepreneurship**
Prerequisites (if any)	**Basic understanding of Plant Anatomy and Evolution**	

Activities:

- To get familiarized with the techniques of section cutting, double staining maceration and clearing.
- To study anatomical details of angiosperms through permanent slides and Laboratory specimens.
- Microscopy techniques
- Section cutting
- Staining and mounting
- Root section of monocot
- Root section of dicots
- Stem section of monocot
- Stem section of dicot
- Economic importance of plants

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	2	3	3	2	3	3	3	1	1
CO2	3	3	3	2	3	3	3	3	2	3	3	3	1	1
CO3	3	2	2	2	3	3	3	3	2	2	2	3	1	1
CO4	2	2	3	2	2	2	2	3	2	3	2	2	3	1

Course Title/Code	**Differential Equations (MAH249B)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**4**	
Course Objective	**To equip the students with the concepts of Ordinary differential equatio ıs.**	
Course Outcomes (COs)		**Mapping**
CO1	**explain and solve some standard types of linear differential equations and its applications.**	**Skill Development**

CO2	**explain and solve the differential equations of 1 st order and 1 st degree and its applications.**	**Skill Development**
CO3	**explain and solve higher order linear differential equations and simultaneous linear differential equations.**	**Skill Development**
CO4	**explain and solve some special types of ordinary differential equations.**	**Skill Development**
CO5	**formulate and solve the linear and non-linear PDE.**	**Skill Development**
CO6	**solve & analyze the differential equations using OCTAVE.**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of sets and real number system.**	

SECTION A

Definition, Formation of a differential equation, Solution of a differential equation, Equations of the first order and first degree, Variables separable, Integrating factors, Homogeneous form – Reducible to homogeneous form, Linear equations, Bernoulli's equation, Exact equations, Equations reducible to exact equations.

SECTION B

Equations of the first order and higher degree, Clairaut's equation solvable for x and y and p, Orthogonal trajectories in polar and Cartesian form, Operator D, Rules for finding the particular integral, Cauchy-Euler differential equation, Legendre's differential equations, Simultaneous differential equations.

SECTION C

Equations which do not contain x, Equation whose one solution is known, Equations which can be solved by changing the independent variable and dependent variable, Variation of parameters, Total differential equation :$Pdx + Qdy + Rdz = 0$, Simultaneous equations of the form $dx/P = dy / Q = dz / R$.

SECTION D

Formation by elimination of arbitrary constants, Formation by elimination of arbitrary functions, Solution by direct integration, Lagrange's linear equations $Pp + Qq = R$,

Standard types of first order non-linear partial differential equations, Charpit's method, Homogeneous linear equations with constant coefficients, Rules for finding the complementary functions, Rules for finding the particular integral, Separation of variables.

References:

Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.An Introduction to Partial Differential Equations by Stephenson, ELBS. A Short Course in Differential Equations by Rainville and Bedient, IBH. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd. Introductory Course in Differential Equations by Murray, Orient Longman. Differential Equations by Simmons, TMH.,Differential Equations by Ayres, Schaum Publishing Company, Ordinary and Partial Differential Equations by Raisinghania, S. Chand and Co. Differential Equations by Vasishta and Sharma, Krishna PrakashanMandir.,A Textbook of Differential Equations by Mittal, Har Anand Publications.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	2	----	----	----	1	2	----	2	2	----	----
CO2	2	3	1	2	----	----	----	1	2	----	2	2	----	----
CO3	2	3	1	2	----	----	----	1	2	----	2	2	----	----
CO4	2	3	1	2	----	----	----	1	2	----	2	2	----	----
CO5	2	3	1	2	----	----	----	1	2	----	2	2	----	----
CO6	----	----	----	----	----	----	2	----	----	----	----	----	----	----

Course Title/Code	**Differential Equations (MAH249-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**1-0-0-0**	
Credits	**4**	
Course Objective	**To equip the students with the concepts of Ordinary differential equatio ıs.**	
Course Outcomes (COs)		**Mapping**
CO1	**To classify Partial differential equations and transform into canonical form.**	**Skill Development**

CO2	**To solve the linear partial equation of both first and second order.**	**Skill Development**
CO3	**To apply partial derivative equation techniques to predict the behaviour of certain phenomenon.**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of sets and real number system.**	

1. To find the solution of exact differential equation.
2. To find the solution of ordinary differential equation.
3. To find the solution of simultaneous linear differential equation.
4. To find the solution of Cauchy's and Legendre's linear differential equation.
5. Plotting of second order solution family of differential equation.
6. Plotting of third order solution family of differential equation.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	2	----	----	----	1	2	----	2	2	----	----
CO2	2	3	1	2	----	----	----	1	2	----	2	2	----	----
CO3	2	3	1	2	----	----	----	1	2	----	2	2	----	----

Course Title/Code	**Animal Physiology and Endocrinology (EDH225-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**To enable students to comprehend the modern concepts of physiological aspects on various organs and systems of animals and human being; to comprehend chemical nature, biological molecules and physiological roles.**	
Course Outcomes (COs)		**Mapping**
CO1	**Comprehend the enzyme action and physiology of digestion**	**Skill Development**
CO2	**Critically analyse the complexity of respiration and understand the mechanism of transport of gases**	**Skill Development**
CO3	**Reflect upon the mechanism of blood circulation, blood clotting and functioning of human heart**	**Skill Development/Employability**
CO4	**Explain the process of excretion and homeostasis**	**Skill development**

CO5	**Explain the process of excretion and homeostasis**	**Skill Development**
CO6	**To conceptualize the mechanism of endocrine and exocrine glands**	**Employability**
Prerequisites (if any)	**----------**	

SECTION A

ENZYME, DIGESTION AND RESPIRATION

Enzymes – Nomenclature and classification, mechanism of enzyme action, Coenzymes

a) Digestion – Physiology of digestion, absorption of carbohydrates, proteins andlipids; Role of vitamins and minerals in normal health

b) Respiration – Mechanism of breathing (external respiration) in man; Respiratory pigments – haemoglobin, haemocyanin, haemerythin and chlorocruorin; Transport ofgases - oxygen transport, oxygen equilibrium curve, Bohr effect; Transport of carbondioxide, chloride shift; Control and regulation of respiration; Review of cellular respiration

SECTION B CIRCULATION, EXCRETION AND HOMEOSTASIS

Circulation: Blood – Composition and physiology of blood clotting ;Lymphatic system , myogenic and neurogenic hearts, structure and functioning of human heart, blood pressure

Excretion: Nitrogenous waste products – Ammonotelism, ureotelism, uricotelism;Ornithinecycle, structure of human kidney and nephron, physiology of urineformation, counter-current multiplier system

Homeostasis – Meaning; Osmoconformers and osmoregulators in marine andfreshwater animals; thermoregulation in animals – Poikilotherms, heterotherms andhomeotherms, adaptive changes in animals

SECTION C

NEURO-MUSCULAR CO-ORDINATION

Nervous Co-ordination – Structure of neuron and neuroglia , Physiology oftransmission of impulse along non-myelinated and myelinated axons ; Synapses –Structure, types and mode of impulse transmission
Muscle contraction – Types of muscles, ultrastructure of striated muscle,Contractile and regulatory proteins, Mechanism of muscle contraction, Neuro-muscular junction and relaxation, sliding filament theory, chemical changes during muscle contraction .

SECTION D

ENDOCRINOLOGY AND HORMONAL CONTROL OF REPRODUCTION

Endocrinology – Outline views of endocrine glands – Pituitary, thyroid, adrenaland pancreas,their structures, secretion and mode of hormone action (steroid andpeptides); hormone feedback mechanism, Gonads – Microscopic structure, hormones produced and their role ; Hormonal regulation of a) Estrous cycle, b) Menstrual cycle, c) Implantation ; Familyplanning - Need and methods of contraceptives .

References Books and Readings:

Animal Physiology and Biochemistry by K.V. Sastry – (Rastogi Publications,2008).

1. Regulatory mechanism in Vertebrates by KamleshwarPandey and J.P. Shukla- (Rastogi Publications, 2008).
2. Animal Physiology by K.A. Goyal and K.V. Sastry – (Rastogi Publications,2008).
3. Endocrinology and Reproductive Biology by K.V. Sastry – (RastogiPublications, 2008).
4. Animal Physiology by Arora M.P. (1989) – Himalaya Publishing House.
5. Textbook of Medical Physiology by Guyton A.C. & Hall J.E. (1996) – (W.B.Saunders & Co.).
6. General and Comparative Physiology by Hoar W.S. (1983) – (Prentice HallPublication).

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	-----	3	----	-----	2	3	1	1	3	3	3
CO2	1	1	2	-----	3	----	-----	2	1	1	1	3	3	3
CO3	1	1	2	-----	--	2	-----	2	1	1	1	3	2	3
CO4	1	1	2	-----	1	----	-----	2	1	1	1	3	3	3
CO5	1	1	2	-	1	-	-----	2	1	1	1	3	3	3
CO6	2	1	2	-	1	-	-----	2	1	1	1	3	3	3

Course Title/Code	**Animal Physiology and Endocrinology Lab (EDH225-P)**	
Course Type	**Core**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To enable students to analyse biochemically the foodstuffs and urine; to analyse he biochemical action of enzymes and to develop the skills of separation of macro molecules using chromatography and electrophoresis; to demonstrate physiological experiments; to develop the skills of haematology and endocrinology.**	
Course Outcomes (COs)		**Mapping**

CO1	**To enable students to analyse biochemically the foodstuffs and urine**	**Skill Development**
CO2	**To enable students to analyse the biochemical action of enzymes**	**Skill Development**
CO3	**To develop in the students the skills of separation of macro molecules using chromatography and electrophoresis**	**Employability**
CO4	**To demonstrate physiological experiments and the skills of haematology and endocrinology**	**Employability /Skill Development**
Prerequisites (if any)	**------**	

1. Demonstration of endocrine glands in rat and man (Chart).
2. Effect of temperature and pH on the salivary amylase enzyme activity.
3. Detection of various enzymes in the digestive tract of cockroach. 4.
   A. Preparation of blood smears of Frog and man

b. Total count of RBC

c. Total count of WBC

d. Differential count of Leucocytes

e. Estimation of haemoglobin by Sahlis method

5. A) Human urine analysis for a) Nitrogenous substances, b) Normal inorganicconstituents, c) Abnormal constituents – (i) glucose, (ii) protein, (iii) ketonebodies.

B) Analysis of nitrogenous wastes in bird and fish.

6. Separation and analysis of amino acids in body fluids and food using paper chromatography.

7.Demonstration of heart beat in Frog – a) Preparation of simple cardiogram, b)Effect of various chemicals on heartbeat.
8.To set up simple experiments to find out the rate of respiration in terrestrialanimals like cockroach and rat. 9.Qualitative and quantitative estimation of carbohydrates, proteins and lipid
10.Demonstration of separation of proteins/enzymes with electrophoresis.
11.Study of permanent slides of mammals: a) Pituitary, b) Adrenal gland,c) Thyroid, dTestis, e) Ovary, f) Placenta, g) Pancreas.

References Books and Readings:

1. Animal Physiology and Biochemistry by K.V. Sastry – (Rastogi Publications,2008).
2. Regulatory mechanism in Vertebrates by KamleshwarPandey and J.P. Shukla- (Rastogi Publications, 2008).
3. Animal Physiology by K.A. Goyal and K.V. Sary – (Rastogi Publications,2008)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	3	-	-	2	1	-	-	-	-	3	--	3
CO2	1	1	2	-	-	-	2	-	-	--	-	3	-	3
CO3	1	-	2	--	-	2	1	-	-	-	-	3	-	3
CO4	1	2	3	--	--	1	2	--	-	3	-	1	-	-

Course Title/Code	Assessment for learning (EDH122- T)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	3-0-0-0	
Credits	3	
Course Objective	To enable a learner to develop basic understanding of concept of assessment and evaluation systems in education.	
Course Outcomes (COs)		Mapping
CO1	Reflect critically on issues in assessment and evaluation	Employability
CO2	Justify the role of continuous and comprehensive assessment in holistic development	Skill Development
CO3	Organize appropriate assessment methods	Entrepreneurship
CO4	Design learning indicators and rubrics as a part of assessment	Employability
CO5	Devise and implement ways to record and report learning landmarks to be supported by feedback	Skill Development
CO6	Access the habit self-critiquing to improve performance.	Skill Development
Prerequisites (if any)		

SECTION A CONCEPT OF EVALUATION

CONCEPT: Concept of measurement, assessment, examination, evaluation and their interrelationships, Distinction between ‘assessment of learning’ and ‘assessment for learning’.

FORMS OF ASSESSMENT: Based on purpose**:** (formative, summative; prognostic, diagnostic; norm referenced, criterion referenced), Based on nature of information gathered: Qualitative (observation, introspection, projection and sociometry) or Quantitative (written, oral, practical), Purpose of assessment in a 'constructivist paradigm'.

SECTION B ASSESSMENT AND RECORDKEEPING

ABILITY TO DEVELOP INDICATORS FOR ASSESSMENT: tasks for assessment (projects, assignments); formulating tasks and questions that engage the learner and demonstrate the process of thinking; scope for original responses.

OBSERVATION of learning process by self, by peers, by teachers, Self appraisal. Organizing and planning for student portfolios and developing rubrics for portfolio assessment, teacher's diaries.

GROUP ACTIVITIES FOR ASSESSMENT (nature of group dynamics, socio-metric techniques, steps for formation of groups, criteria for assessing tasks; criteria's for assessment of social skills in cooperative and colLaborative leaning situations)

DIMENSIONS AND LEVELS OF LEARNING, assessing conceptual development, recall of facts and concepts, application of specific skills, problem solving; application of learning to diverse and new situations (Construction of achievement test).

SECTION C

INTERPRETATION OF STUDENT'S PERFORMANCE

Descriptive statistics (measures of central tendency and percentages), Measures of variability, Graphical representations -histogram, frequency curves, pie charts, NPC –percentile, skewness and kurtosis. Grading – meaning, types and uses

SECTION D

FEEDBACK: feedback as an essential component of assessment, Role of feedback to stakeholders (students/peers, parents, teachers), to improve teaching-learning process, identifying the strengths and weaknesses of learners.

REPORTING STUDENTS' PERFORMANCE: progress reports, cumulative records, Developing and maintaining a comprehensive learner profile and their uses, portfolios, Challenges of assessment, Remedial Teaching.

References Books:

1. Ved Prakash, et.al. (2000): *Grading in schools*, NCERT, Published at the publication Division by the secretary, NCERT, Sri Aurobindo Marg, New Delhi
2. Popham, W. J. (2002). *Classroom Assessment: What teachers need to know* (Third Edition) Boston: Allyn &Bacon.
3. Gredler, M. E. (1999). *Classroom Assessment and Learning*. USA: Longman.
4. Linn, Robert L. and Gronlund, Norman E. (2000). Measurement and Assessment in Teaching. Pearson Education Inc.
5. Oosterhof, A. (1994). *Classroom Applications of Educational Measurement* (Second Edition). New York: Macmillan College Publishing Company Inc.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	3	3	3	2	1	2	3	3	2	3	2	1	2	1
CO2	3	2	2	2	1	2	3	3	2	3	2	1	2	2
CO3	3	1	-------	-	3	2	3	3	2	3	2	3	1	1
CO4	3	1	2	2	2	2	3	3	2	3	2	1	2	1
CO5	3	1	2	2	2	2	3	3	2	3	2	1	1	1

Course Title/Code	**Assessment for Learning Lab (EDH122-P)**
Course Type	**Core**
Course Nature	**Hard**

L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To enable a learner to apply the concepts of assessment and evaluation systems in education**	
Course Outcomes (COs)		**Mapping**
CO1	**Demonstrate the standards learners are required to achieve and help them recognise when they have achieved that standard**	**Employability**
CO2	**To give effective feedback on assessment decisions**	**Skill Development**
CO3	**To reflect on the last performance and review learners' progress**	**Entrepreneurship**
Prerequisites (if any)		

1. Critically read and reflect on the 'National Focus Group Position Paper on Examination Reforms'
2. A perception scale to explore perceptions of stakeholder (parents, teachers and students) about prevailing examination system and present a report.
3. Critique of prevailing culture of popular tests such as Olympiads.
4. Devise a strategy to incorporate the suggestions given in the first CCE report for the progress of the learner.
5. Essay on 'Effect of assessment on self-esteem, motivation and identity of learners'.
6. Critical Analysis of "CCE Manual for Teachers-Elementary level"
7. Prepare rubrics for assessment of a topic of your choice from Elementary School Level.
8. Prepare a PowerPoint presentation on the outline of scholastic and co-scholastic components of CCE. 9. Constructing a unit test using a table of specification, administering it to a group of students and interpreting the result.

*Field activity

CO	PO1	PO2	PO3	PO4	P05	P06	PO7	PO8	PO9	PO10	PO11
CO1	3	-----	1	-----	-----	3	3	3	-----	-----	-----
CO2	3	-----	1	-----	-----	3	3	3	-----	2	1
CO3	3	-----	1	-----	-----	3	3	3	-----	-----	1

Course Title/Code	School Organisation and Management (EDS227)	
Course Type	Core	
Course Nature	Soft	
L-T-P-0 Structure	1-0-2-0	
Credits	2	
Course Objective	To Facilitate the Basics of School Organisation and management in the Learners.	
Course Outcomes (COs)		Mapping
CO1	Use various strategies to create positive school climate	Entrepreneurship Employability
CO2	Analyse various features of school as an organization.	Entrepreneurship
CO3	Discuss different components of school management	Entrepreneurship Employability
CO4	Assimilate the concept and process of educational administration	Entrepreneurship Employability
Prerequisites (if any)		

Practical Topics:

1. Preparation of an Academic Calendar of School
2. Preparation of an annual calendar for the schools co-curricular activities for the current session.
3. Class Presentations on difference in the competencies required for a traditional and 21st century Teachers.
4. Organize a group discussion on the Professional Ethics and Code of Conduct for teachers.
5. Survey of hostel and library and make a report of the problems faced by the students.
6. A Practical activity on the positive school climate.
7. Preparation of an outline of an institutional planning on any aspect of school organization.

8. Preparation of Class Time Table.

9. Write an assignment on how NCERT, SCERT and NAAC is ensuring external & internal quality at higher education
10. Critically analyze the allocation of budget to the education sector in the current Financial Year
11. Identify different ICT resources used by School Management and Administration.

References And Readings:

1. Agarwal, J.C. and Sharma, K. R.(2006): *Basic School Organisation*, Doaba House, Delhi
2. Agarwal, J.C. (2006): *School Administration*, Arya Book Depot, Delhi.

3. Mohanthy, Jagannath (2007). *Educational Management, Supervision, School Organization*. Hyderabad: Neelkamal Publications Pvt. Ltd.

4. Owens, Robert G (1970): *Organizational Behaviour in Schools*. Prentice Hall Inc., Englewood Cliffs, N.J., Publishing House.

5. Safaya, R.N. and Shaida, B.D.(2000). School Administration and Organization. Dhanpat Rai and Sons, Delhi

6. NAAC (2003). *Total Quality Management for Tertiary Education* Bangalore: NAAC. Retrievedfrom: *www.naac.gov.in/.../Total%20Quality%20Management%20for%20Tertia.*

CO	PO 1	PO2	PO3	PO 4	PO5	PO 6	PO7	PO 8	PO9	PO1 0	PO1 1	PSO 1	PSO2	PSO 3
CO1	3	3	3	2	---	2	----	3	---	2	2	----	2	3
CO2	----	----	3	3	---	3	---	3	----	2	2	-----	2	3
CO3	----	----	3	3	----	3	----	3	----	2	2	---	2	3
CO4	1	1	3	2	---	2	----	3	---	2	2	----	2	3

Course Title/Code	**E-Learning (EDW228)**	
Course Type	**Core**	
Course Nature	**Workshop**	
L-T-P-0 Structure	**0-0-3-0**	
Credits	**1.5**	
Course Objective	**Student Readiness regarding E-learning**	
Course Outcomes (COs)		**Mapping**
CO1	**Understand concept of e-learning and key concepts**	**Employability**
CO2	**Use blended learning approach in e-learning**	**Skill Development**
CO3	**Use different online tools and resources in assessment**	**Skill Development**
CO4	**Explore and use the potentialities of Information Communication Technology for colLaborative, constructive & inquiry-based learning**	**Entrepreneurship**
Prerequisites (if any)		

SECTION A

Unit 1: Basic of e-learning

- Concept of e-learning
- Types of e-learning
- Terminologies related to e-learning

Activity

 Learners create mind map of e-learning

Unit 2: Use of ICT for learning management

 Record keeping and scheduling tools

 Communicative tools

 Learning management system-Introduction

Activity

 Use Google classroom, create classroom, create assignment

 Use google drive and dropbox for storing document

Unit 3:ICT for teaching learning process

 Blended learning approach for e-learning

 Tools for conducting online classes

 Digital tools for collaborative & constructivE- learning-Google doc,Discussion forum, Activity:

 Prepare a week plan of teaching using blended learning approach

 Analyse online platforms for online classes

 Conduct a seminar using online platform

 Discuss any ICT related issue using any mode of online discussion forum.

Unit 4: ICT in Assessment Computer

assisted assessment

 Use of e-portfolios, Rubrics in assessment

 Use of innovative strategies for formative assessment

Activity

- Create e portfolio of this workshop
- Create rubric to assess group discussion
- Generate a test
- Create crosswords puzzles etc

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	3	1	1	1	1	3	1	1	1	1	1	1
CO2	3	2	2	2	3	3	1	3	1	2	2	1	3	2
CO3	2	3	3	3	3	1	3	1	2	1	2	1	1	1
CO4	2	3	2	3	3	2	3	1	2	2	2	1	3	2

Course Title/Code	**Design Thinking: A Primer (MOOC-19E-EDS-202)**	
Course Type	**Core**	
Course Nature	**NTCC**	
L-T-P-0 Structure	**0-0-0-3**	
Credits	**1.5**	
Course Objective	**The Course aims at developing skills related with design thinking**	
Course Outcomes (COs)		**Mapping**
CO1	**To know about design thinking**	**Employability /Skill**
CO2	**To learn about customer journey mapping**	**Skill Development**
CO3	**To know about the analysis phase of design thinking**	**Entrepreneurship/Skill**

CO4	**To know about the ideation phase of design thinking**	**Skill development**
Prerequisites (if any)	**NA**	

Syllabus

1. Introduction to Design Thinking Week
2. Empathize Phase: Customer Journey Mapping Week
3. Analyze Phase: 5-Whys and How might we... Week
4. Solve Phase: Ideation: Free Brainstorming & Make/Test Phase: Prototype

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	0	0	1	------	0	----	0	0	-	1	1
CO2	1	1	1	0	0	0	0	0	0	0	---	-	2	2
CO3	1	1	2	0	0	1	0	1	0	0	---	-	2	1
CO4	1	1	2	0	0	1	0	0	0	0	---	-	2	2

Course Title/Code	**Street Play/Skit/Mime (EDN229)**
Course Type	**Core**
Course Nature	**Workshop**
L-T-P-0 Structure	**1-0-2-0**
Credits	**1.5**
Course Objective	**The course aims at developing social awareness**

Course Outcomes (COs)		Mapping
CO1	To develop a social sensitivity	Employability
CO2	understand and identify the social needs of society	Skill Development
CO3	To organize camps related with social issues	Entrepreneurship
Prerequisites (if any)		

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	-	-	1	1	1	1	1
CO2	1	1	-	-	-	-	-	-	-	1	1	1	1	1
CO3	1	1	-	-	-	-	-	-	1	1	1	1	1	1

Course Title/Code	Principles of Human Resource Management/ MOOC-19E-EDS-201	
Course Type	Elective	
Course Nature	MOOC	
L-T-P-0 Structure	0-0-0-3	
Credits	2	
Course Objective	The Course aims at developing communication skills among learners	
Course Outcomes (COs)		Mapping
CO1	To know about staffing/recruitment	Employability /Skill
CO2	To explore performance management and appraisal process	Skill Development
CO3	To explore training and development	Entrepreneurship/Skill
CO4	To evaluate processes of career management	Skill development

Prerequisites (if any)	

SECTION A

Management: Definition, nature, purpose and scope of management, Skills and roles of a manager, functions, principles; Evolution of Management Thought, Scientific Management.
Planning: Types of plans, planning process, Characteristics of planning, Traditional objective setting, Strategic Management, premising and forecasting
Decision-Making: Process, Simon's model of decision making, creative problem solving, group decision making.

SECTION B

Management by Objectives: Management by exception; Styles of management: (American, Japanese and Indian), McKinsey's 7-S Approach, Self-Management
Organizing: Organizational design and structure, Coordination, differentiation and integration.
Span of management, centralization and de-centralization Delegation, Authority & power - concept & distinction, Line and staff organizations

SECTION C

Staffing: Human Resource Management and Selection, Performance appraisal and Career strategy, Coordination- Concepts, issues and techniques
Organizational Change: Introduction, Resistance to Change, Behavioral Reactions to Change, Approaches or Models to Managing Organizational Change.
Organizational Change: Introduction, Resistance to Change, Behavioral Reactions to Change, Approaches Or Models to Managing Organizational Change.

SECTION D

Leading: Human Factors and Motivation, Leadership, Communication, Teams and Team Work
Leading: Human Factors and Motivation, Leadership, Communication, Teams and Team Work

Controlling: Concept, planning-control relationship, process of control, Types of Control, Control Techniques Characteristics of team

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	----	----	----	----	----	----	----	1	1	1	1	1
CO2	1	1	----	----	----	----	----	----	----	2	1	1	1	1
CO3	1	1	----	----	----	----	----	----	----	2	1	1	1	1
CO4	1	1	----	----	----	----	----	----	----	2	1	1	1	1

Course Title/Course Code	**Basics of Economics / MCS231**
Course Type	**Elective**
Course Nature	**Soft**
LTP Structure	**1-0-2-0**

Credits	**2**	
Objective	**Students (A) will be able to explain the basic economic concepts and laws, (B) their relation with real life situations, (C) discuss the nature and characteristics of Indian Economy.**	
Course Outcomes		
CO1	**To comprehend the economic problems of the society.**	**Employability**
CO2	**To Enlighten the laws of utility, demand and supply and their measurement.**	**Entrepreneurship**
CO3	**To Explain the laws of production and various concepts of costs.**	**Entrepreneurship**
CO4	**To eLaborate the various market forms**	**Skill Development**

SECTION A

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

SECTION B

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, degrees of Price elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

SECTION C

Meaning of production and factors of production, laws of production, various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost and opportunity cost. Shape of short run cost curves.

SECTION D

Meaning of Market, Types of Market -Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets). Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

REFERENCES

3. Principles of Economics: P.N. Chopra (Kalyani Publishers).
4. Economics for Engineers- T R Jain & O P Khanna
5. Micro Economic Theory – M.L. Jhingan (S.Chand).
6. Micro Economic Theory - H.L. Ahuja (S.Chand).
7. Modern Micro Economics: S.K. Mishra (Pragati Publications).
8. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.).
9. Indian Economy: Rudar Dutt & K.P.M. Sundhram

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	1	--	--	--	--	3	2	2	--	2	2
CO2	1	1	1	1	--	--	--	--	1	1	1	--	1	1
CO3	2	1	2	1	--	--	--	--	1	2	3	--	2	3
CO4	2	1	--	--	--	--	--	--	3	1	1	--	1	1

Course Title	**Introduction to Finance MCS232**
Course Type	**Elective**
Course Nature	**Soft**
LTP Structure	**1-0-2-0**
Credits	**2**
Objective	**This course's goal is to teach students to fundamental financial concepts. A job in corporate finance or additional study in the fields of investments, real estate, banking, and insurance require this foundational understanding.**

Course Outcomes

CO1	**To take an overview of financial management and its need to take financial decisions.**	**Employability**
CO2	**To understand financial statements and distinguishes between profit & loss and Balance sheet of different business organizations.**	**Entrepreneurship**
CO3	**To identify the different sources of long-term finance and differentiate amongst equity, preference and Debt**	**Skill Development**
CO4	**To elaborate and apply various techniques of capital budgeting and analyse cost of capital and capital structure**	**Skill Development**

SECTION A

Financial Management: An Overview—forms of business organization, financial decision in a firm, Financial System, Financial Markets and Intermediaries.

SECTION B

Financial Analysis and Planning: Financial Statements-Balance sheet, Statement of Profit and Loss, Taxes and Cash Flow, Financial Ratios, Break Even Analysis.

SECTION C

Sources of Long-term Finance – Equity Capital, Preference Capital, Terms Loans, Debentures; Raising Long term Finance

SECTION D

Time Value of Money, Capital Budgeting- Techniques of Capital Budgeting, Net Present Value and Payback Period, Capital Structure and Cost of Capital

REFERENCES

1. Pandy, I.M., Financial Management, Vikas Publishing House, New Delhi
2. Khan M.Y, and Jain P.K., Financial Management, Tata McGraw Hill, New Delhi
3. Keown, Arthur J., Martin, John D., Petty, J. William and Scott, David F, Financial Management, Pearson Education
4. Chandra, Prasanna, Financial Management, TMH, New Delhi
5. Van Horne, James C., Financial Management and Policy, Prentice Hall of India
6. Brigham & Houston, Fundamentals of Financial Management, Thomson Learning, Bombay.
7. Kishore, R., Financial Management, Taxman's Publishing House, New Delhi.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	--	3	2	1	--	-	-	-	-	2	2
CO2	3	2	1	--	3	2	1	--	-	-	-	-	1	1
CO3	3	2	1	-	3	2	1	--	-	-	-	-	2	3
CO4	3	2	1	-	3	2	1	--	-	-	-	-	1	1

Course Title/Code	**Spanish-II/ FLS105**	
Course Type	**University Compulsory**	
Course Nature	**Elective**	
L-T-P-0 Structure	**1-1-0-0**	
Credits	**0**	
Course Objective	**Demonstrate advanced proficiency in spoken and written Spanish**	
Course Outcomes (COs)		**Mapping**
CO1	**Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.**	**Skill Development**

CO2	**Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes.**	**Skill Development**
CO3	**Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.**	**Skill Development**
CO4	**Students will be able to understand audio text and comprehend to the same. They will be able to form paragraph using auxilary verb and basic verbs.**	**Skill Development**
CO5	**Students will be introduced to French culture and civilization. They will be able to describe various places and locations of Francophonic countries.**	**Skill Development**

SECTION-A

Unit 1- Mi famila

1.1 Describe your family

1.2 Adjectives to describe a person

1.3 Short essay on family & friend

Unit 2- Gustar

2.1 Likes and dislikes

2.2 Conjugation

2.3 Comprehension

SECTION-B

Unit 3- Verbos Irregulares y reflexivos

3.1 Conjugation
3.2 Routina diaria

3.3 Sentence formation

SECTION-C

Unit 4- El horario

4.1 Timings

4.2 Colours

Unit 5- Estar+gerundio

5.1 Conjugation

5.2 Prepositions

5.3 Picture description

SECTION-D

Unit 6- Ser y estar

6.1 Direction

6.2 Comprehension

Text Books/Reference Books:

¡Ole!-Langers

¡Uno, dos, tres…… Weblinks:

http://studyspanish.com/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	-	-	-	-	-	-	-	-		2	2
CO2	2	3	3	-	-	-	-	-	-	-	-		1	1
CO3	1	3	3	-	-	-	-	2	1	-	-		2	3
CO4	1	1	2	-	-	-	-	3	1	-	-		1	1
CO5	1	1	3	-	-	-	-	3	2	-	-			

Course Title/Code	**German-II(FLS106)**
Course Type	**University Compulsory**

Course Nature	**Elective**	
L-T-P-0 Structure	**1-1-0-0**	
Credits	**0**	
Course Objective	**Demonstrate awareness of cultural and historical differences between the culture of German-speaking countries and the student's native culture.**	
Course Outcomes (COs)		**Mapping**
CO1	**Students will be able to exchange greetings and introductions using formal and informal expressions. They will be able to ask and answer simple questions.**	**Skill Development**
CO2	**Students will be able to discuss everyday life and daily routines, using simple sentences and familiar vocabulary.**	**Skill Development**

CO3	**Students will be able to identify key details in short, highly-contextualized audio text dealing with a familiar topic, relying on repetition and extra linguistic support when needed. Students will be able to discuss likes and dislikes, understand simple conversations about familiar topics (e.g., greetings, weather, sports, hobbies and daily activities,) with repetition when needed.**	**Skill Development**
CO4	**Students will be able to differentiate certain patterns of behavior in the cultures of the German- speaking world and the student's native culture. Students will be able to describe various places, location, themselves using simple sentences and vocabulary.**	**Skill Development**

SECTION-A

Unit 1- Mifamila

1.1 Describe your family

1.2 Adjectives to describe a person

1.3 Short essay on family & friend

Unit 2- Gustar

2.1 Likes and dislikes

2.2 Conjugation

2.3 Comprehension

SECTION-B

Unit 3- VerbosIrregulares y reflexivos

3.1 Conjugation

3.2 Routinadiaria

3.3 Sentence formation

SECTION-C

Unit 4- El horario

4.1 Timings

4.2 Colours

Unit 5- Estar+gerundio

5.1 Conjugation

5.2 Prepositions

5.3Picture description

SECTION-D

Unit 6- Ser y estar

6.1 Direction

6.2 Comprehension

Text Books/Reference Books:

¡Ole!-Langers

¡Uno, dos, tres……

Weblinks: http://studyspanish.com/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	3	-	-	-	-	1	1	-	-	-	-	-
CO2	1	2	3	-	-	-	-	2	2	-	-	-	-	-
CO3	1	1	2	-	-	-	-	1	2	-	-	-	-	-

CO4	1	3	3	-	-	-	-	2	2	-	-	-	-	-
CO5	1	1	1	-	-	-	-	2	2	-	-	-	-	-

Course Title/Code	**French-II (FLS107)**	
Course Type	**University Compulsory**	
Course Nature	**Elective**	
L-T-P-0 Structure	**1-1-0-0**	
Credits	**0**	
Course Objective	**Demonstrate advanced proficiency in spoken and written French**	
Course Outcomes (COs)		**Mapping**
CO1	**Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.**	**Skill Development**

CO2	**Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes.**	**Skill Development**
CO3	**Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.**	**Skill Development**
CO4	**Students will be able to understand audio text and comprehend to the same. They will be able to form paragraph using auxilary verb and basic verbs.**	**Skill Development**
CO5	**Students will be introduced to French culture and civilization. They will be able to describe various places and locations of Francophonic countries.**	**Skill Development**

Unit A

- Les alphabets
- Les salutations & forms of politeness
- Expression on taking leave
- Self Introduction

Unit B

- La culture de France
- Presentation on French Language
- Présentez-vous
- Les Pronoms Sujets

- “ER” verbs
- “IR” verbs

Unit C

- Les articles définis et indéfinis
- Les Nombres en Cardinal (0-1000)
- Les Nombres en Ordinal (0-1000)
- Les noms et les Adjectifs
- Les verbes (avoir, être, faire, aller, venir)
- Masculin et Féminin
- Les Pluriels

Unit D

- Moments of the day
- Days of the week & related questions
- Months of the year & related questions
- Les couleurs
- Les verbes (vouloir, pouvoir, savoir, devoir)
- Les Nationalités

Suggested Readings:

1. Apprenons le français, Méthode de français part 2, Mahitha Ranjit, Saraswati House Pvt.ltd
2. Apprenons le français, Méthode de français part 3, Mahitha Ranjit, Saraswati House Pvt.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	3	2	3	2	2	-	2	2	-	1	-	-	1
CO2	1	2	2	3	2	1	-	1	1	-	-	-	-	-
CO3	1	3	2	3	-	1	-	2	1	-	-	-	1	-
CO4	1	3	2	3	-	1	-	2	1	-	-	-	1	2
CO5	1	3	2	3	-	1	-	1	1	-	-	-	-	1

Course Title/Code	**Community Connect Program (EDO239)**
Course Type	**Core**
L-T-P Structure	**0-0-0**
Credits	**1.5**
Course Objective	
Outcomes	**To equip the learners to do intensive research on a specific case, and to make it possible to identify essential factors, processes and relationships in teaching learning process**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	3	2
CO2	3	-	-	-	-	-	-	-	-	3	2
CO3	3	-	-	-	-	-	-	1	-	3	2
CO4	3	-	-	-	-	-	-	1	-	3	2

SEMESTER - 5										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/Workshop/ NTCC)**	**COURSE TYPE (Core/Elective /University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
CHH312-T	**Transition Elements, Coordination Compounds and Chemical Kinetics**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
CHH312-P	**Transition Elements, Coordination Compounds and Chemical Kinetics Lab**				**0**	**0**	**2**	**0**		
PHH330-T	**Basic Electronics**	**APPLIED**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**

PHH330-P	**Basic Electronics Lab**	**SCIENCE**			**0**	**0**	**2**	**0**		
EDH301-T	**Plant Systematics and Angiosperm Phylogeny**	**EDU**			**3**	**0**	**0**	**0**	**5**	
EDH301-P	**Plant Systematics and Angiosperm Phylogeny Lab**				**0**	**0**	**2**	**0**		
MAH319B	**DIFFERENTIAL EQUATIONS**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**4**	**4**
EDH302-T	**Ecology and Animal Behaviour**	**EDU**			**3**	**0**	**0**	**0**	**5**	
EDH302	**Ecology and Animal Behaviour Lab**				**0**	**0**	**2**	**0**		

EDH303-T	**Cell Biology and Genetics**	**EDU**	**HARD**	**CORE**	**3**	**0**	**0**	**0**	**5**	**4**
EDH303-P	**Cell Biology and Genetics Lab**				**0**	**0**	**2**	**0**		
EDH214-T	**Education in Contemporary India**	**EDU**	**HARD**	**CORE**	**3**	**0**	**0**	**0**	**5**	**4**
EDH214-P	**Education in Contemporary India Lab**				**0**	**0**	**2**	**0**		
EDH109-T	**Pedagogy of Biological Sciences**	**EDU**	**HARD**	**CORE ELECTIVE**	**3**	**0**	**0**	**0**	**5**	**4**
EDH109-P	**Pedagogy of Biological Sciences Lab**				**0**	**0**	**2**	**0**		
EDH110-T	**Pedagogy of Mathematics**				**3**	**0**	**0**	**0**		

EDH110-P	Pedagogy of Mathematics Lab				0	0	2	0		
EDW228	elearning	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDW304	Yoga & Health Education	EDU	WORKSHOP	CORE	0	0	3	0	3	1.5
EDN305	Colloquium	EDU	NTCC	CORE	0	0	0	0	0	2
EDO209	Phase I (Field Engagement)	EDU	OUTCOME	CORE	0	0	0	0	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				15(PCM)/18(ZBC)	3(PCM)/1(ZBC)	11(PCM)/15(ZBC)	0	29 (PCM)/34 (ZBC)	27 (PCM)/31 (ZBC)

Course Title/Code	Transition Elements, Coordination Compounds and Chemical Kinetics (CHH312-T)
Course Type	Core
Course Nature	Hard

L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**Students learn the properties of coordination compounds in terms of bonding theories, able to identify the properties of d and f block elements and their compounds in terms of their electronic configuration and understand the Principles of Chemical Kinetics and Surface Chemistry**	
Course Outcomes (COs)		**Mapping**
CO1	**Interpret the properties of d and f block elements and their compounds in terms of their electronic configuration and bonding.**	**Skill Development**
CO2	**Identify the properties of coordination compounds in terms of bonding theories**	**Skill Development**
CO3	**Develop knowledge on Principles of Chemical Kinetics**	**Skill Development**
CO4	**Develop knowledge on Principles of Surface Chemistry**	**Skill Development**
Prerequisites	**Atomic structure & Bonding; States of matter and nuclear chemistry; Thermodynamics, Equilibrium and Solutions**	

SECTION A

D-BLOCK AND F-BLOCK ELEMENTS

To relate the electronic configuration to the properties and structure of transition metals and their compounds. Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.
Chemistry of Elements of Second and Third Transition Series
General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry. Powder metallurgy
– extraction of tungsten. Position of lanthanides and actinides in the periodic table, lanthanide contraction, spectral and magnetic properties of lanthanides, separation of lanthanides and actinides.

SECTION B

COORDINATION COMPOUNDS

Discussion of experiential knowledge to account for the spontaneity in changes around us.: need for the Second law of thermodynamics, different statements of the law, Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature.Concept of Entropy: Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical changes, Clausius inequality, entropy as a criterion of spontaneity and equilibrium. Entropy changes in ideal gases and mixing of gases. Gibbs and

Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities. A and Gas criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. **(8 L)**

SECTION C

CHEMICAL KINETICS

Understanding the factors that influence a chemical reaction and rationalizing them on the basis of known theories of reaction rates. Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions – zero order, first order, second order, pseudo-order, half-life and mean life. Determination of the order of reaction – differential method, method of integration, method of half-life period and isolation method. Radioactive decay as a first order phenomenon.

Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy,
Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects. **(8 L)**

SECTION D

SURFACE PHENOMENA

Study of Characteristics of Solid surface, surface phenomenon to explain various applications in daily life situations. Catalysis, characteristics of catalyzed reactions, classification of catalysis, miscellaneous examples. Physical and Chemical adsorptions. Derivation of Langmuir Adsorption Isotherm. Statement and explanation of BET and Gibbs Isotherms. Determination of surface area of adsorbent using Langmuir equation. Adsorption theory of Catalysts using Langmuir's Equation **(8 L)**

Reference Books and Readings:

1. Concise Inorganic Chemistry: J D Lee
2. An Introduction to Inorganic Chemistry: Mackay and Mackay
3. Principles of Physical Chemistry: Marron and Prutton
4. Elements of Physical Chemistry: Samuel Glasstone and Lewis
5. Physical Chemistry: P W Atkins
6. Inorganic Chemistry: James Huhey

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	--	--	--	--	--	--	2	--	--	3	2	--
CO2	2	2	--	--	--	--	--	--	2	--	--	3	2	1
CO3	--	3	--	--	--	--	--	--	2	--	--	3	2	1
CO4	1	--	--	--	--	--	--	--	2	--	1	3	2	1

Course Title/Code	Transition Elements, Coordination Compounds and Chemical Kinetics Lab (CHH312-P)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	0-0-2-0	
Credit	1	
Course Objective	Students familiarize in transition metal estimation, synthesis of inorganic compounds, study the kinetics and understand surface chemistry concepts by experiments.	
Course Outcomes (COs)		Mapping
CO1	To familiarize the transition metals and estimating them by gravimetric analysis	Employability
CO2	To familiarize the properties of coordination compounds and determine the crystal field stabilization energy of metal complexes	Skill Development
CO3	To explore the kinetics of a reaction by titrimetric and spectrophotometric methods	Employability
CO4	To understand surface chemistry by adsorption, viscosity and partition coefficient experiments	Skill Development
Prerequisites	XII, TESLab	

Chemical Kinetics

1. Iodination of Acetone by titration and Colorimetry.
2. Acid Hydrolysis of Ester
3. Reaction between Potassium Peroxydisulphate and Potassium Iodide.
4. Base Hydrolysis of an Ester by Titration and Conductometry
5. Iodine clock reaction
6. Solvolysis of Tertiary Butyl Chloride by Titrimetry, conductometry and pH metry
7. Inversion of Cane Sugar

Coordination Complexes :Preparation of Cobalt and Chromium Complexes and analyzing them titrimetrically and Spectrophotometrically.

References:

2. A Text Book of Quantitative Inorganic Analysis, A I Vogel
3. Practical Physical Chemistry, A Findlay

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	1	-	-	1	-	1
CO2	3	2	-	-	-	-	-	-	1	-	-	1	-	1
CO3	3	2	-	-	-	-	-	-	1	-	-	1	-	1
CO4	3	2	-	-	-	-	-	-	1	-	-	1	-	1

Course Title/Code	**Basic Electronics (PHH330-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**To provide the students with an introductory and broad treatment of the field of Electronics Engineering to facilitate better understanding of the devices, instruments and sensors used in various applications.**	
Course Outcomes (COs)		**Mapping**
CO1	**CO1: Understand, explain and demonstrate various laws and concepts of basic semiconductor physics and simulate applications for diodes, LEDs and rectifiers. The students would be able to analyze and evaluate the related problems.**	**Skill Development**
CO2	**Understand, explain and demonstrate various laws and concepts of basic semiconductor physics and simulate applications for Transistor, FETs and MOSFETS. The students would be able to analyze and evaluate the related problems.**	**Skill Development**
CO3	**Understand, explain and demonstrate various number systems, construction and working of basic logic gates, Discussing the working of transistors, diodes, and operational amplifiers and solving the related problem.**	**Skill Development**
CO4	**Understand, explain and demonstrate various Modulation methods and their application in daily communications. Solving the problem related to methods of communications is also discussed and practiced.**	**Skill Development**

CO5	**Demonstrate an ability to conduct investigations of practical/technical issues consistent with their level of knowledge and understanding while designing/performing/resolving the experiments to develop their individual capabilities and representing the collective team work. Demonstrate an ability to analyze data and reach a valid**	**Employ hypo - deductive problemsolving skills. Develop inductive, deductive and self-learning attitude.**
	conclusion.	
Prerequisites (if any)	**Knowledge of basic semiconductors is required.**	

SECTION A

Semiconductor Characteristics and Applications: Review: Intrinsic and extrinsic semiconductors, electrons and holes in intrinsic and extrinsic semiconductors, conduction by electrons and holes, conductivity of a semiconductor, Energy bands in semiconductors. Carrier concentrations in intrinsic and extrinsic semiconductors, Fermi level, donor and acceptor levels in extrinsic semiconductors. P-N junction diode – depletion layer, conduction in PN junction diode (FB and RB Condition), characteristics, diode resistance. Half wave and full wave rectifiers, power output and efficiency, Ripple factors. Breakdown in diodes – Zener breakdown, Zener diode characteristics and application in voltage regulation. LED's, Photo diodes.

Section B

Transistors and Applications: Bipolar junction transistor (PNP and NPN) transistors, different configurations and characteristics, current components in CE configuration, large signal and small signal dc current gains, transistor biasing – self bias circuit, Load line and operating point. *Transistor as an amplifier*: Transistor as a two-port device, *h*-parameters and analysis of CE amplifier using *h* parameter equivalent circuit, simplified *h*-parameter circuit, stabilization of voltage gain in CE amplifiers, frequency response of CE amplifier. Two stage amplifiers, RC coupling, Comparison of transistor configurations. Emitter follower circuit and its use. Transistor as Power amplifier. FET construction and its characteristics – MOSFET characteristics. Amplifiers: Concept of feedback in amplifiers and advantages of negative feedback.
Oscillators: Requirements for oscillation, Barkhausen criterion, Hartley and Colpitts oscillators.

Section C

Digital Electronics: Binary to decimal and decimal to binary conversion, Binary addition and subtraction, Octal number system, Hexadecimal system and their conversions. Construction and working of AND, OR, NOT logic gates using diodes and transistors. Construction of NOT gate using transistor. Symbols and truth table for AND, OR, NOT, NAND, NOR and Ex-OR logic gates. Boolean

algebra, Boolean laws, Morgan's theorem. NAND and NOR as universal gates. *Introduction to OP-AMP*. Differential amplifiers, principle of OP-AMP, OP-AMP parameters, Applications – Addition, Subtraction, differentiation and integration.

Section D

Communication Electronics: Basic theory of Amplitude modulation, Power in modulated carrier, single side band transmission, Basic idea of frequency and phase modulation. Modulated class C amplifier, Demodulation, PN diode as demodulator linear and square law detection. Propagation of Radio Waves, different layers of ionosphere and their functions.

Text/Reference Books

1. David. A. Bell, Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India
2. Antireal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India
3. Thomas L. Floyd and R. P. Jain, Digital Fundamentals by Pearson Education
4. Paul B. Zbar, A.P. Malvino and M.A. Miller, Basic Electronics – A Text-Lab. Manual, TMH
5. R. T. Paynter, Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	3	3	1	1	1	3	1	2	2	3	1	3
CO2	1	2	3	3	1	1	1	3	1	2	2	3	1	2
CO3	1	2	3	3	1	1	1	3	1	2	2	3	1	2
CO4	1	2	3	3	1	1	1	3	3	3	2	3	3	3

Course Title/Code	**Basic Electronics Lab (PHH330-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To provide the students with an introductory and broad treatment of the field of Electronics Engineering to facilitate better understanding of the devices, instruments and sensors used in various applications.**	
Course Outcomes (COs)		**Mapping**
CO1	**Demonstrate an ability to conduct investigations of practical/technical issues consistent with their level of knowledge and understanding while designing/performing/resolving the experiments to develop their individual capabilities and representing the collective team work. Demonstrate an ability to analyze data and reach a valid conclusion.**	**Employability**
Prerequisites (if any)	**Mathematical knowledge and experimental understanding of electronics components and their behavior is required**	

The list of experiments are:

1. To plot the VI characteristics of PN Junction Diode.
2. To study the half wave rectification
3. To study the full wave rectification using bridge rectifier
4. To study the Zener diode as voltage regulator 5. To study the common emitter characteristics of BJT.
6. To study the common base characteristics of BJT.
7. To study the BJT as Common Emitter amplifier.
8. To study the Differentiator and Integrator properties of Operational Amplifier

References:

1. Practical Physics- S. L. Gupta and V. Kumar
2. B.Sc. Practical Physics- Harnam Singh and P. S. Hemine
3. Advanced Practical Physics- Chauhan and Singh

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1			3	3		2		3	3	2	1	3	1	2

Course Title/Code	**Plant Systematics and Angiosperm Phylogeny (EDH301-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-O Structure	**(3-0-0-0)**	
Credit	**3**	
Objectives	**After going through this course, the learner will be able to appreciate the evolution of taxonomic thought and the various systems of classification**	
Course Outcomes (COs)		**Mapping**
CO1	**Understand the basis, aim and principles of classification of Angiosperms**	**Skill Development**
CO2	**Understand the salient features of Bentham and Hooker Classification**	**Skill Development**

CO3	**Understand the diagonistic features, salient vegetative and floral characteristics and economically important plant of various Angiosperm (dicot) families.**	**Skill Development/Employability**
CO4	**Understand the diagonistic features, salient vegetative and floral characteristics and economically important plant of various Angiosperm (monocot) families.**	**Skill development**
Prerequisites (if any)	**----------**	

SECTION A

PLANT SYSTEMATICS

ICN (formerly known as ICBN), principles and aims; type Concept, Concept of genus and specific epithet, Principle of priority, Units of classification, Brief history, Development of taxonomic thought, Outlines of artificial, natural and phylogenetic systems of classification. Salient features and outline classification of Bentham & Hooker and Cronquist. Brief introduction to Angiosperm Phylogeny Group classification (APG).

SECTION B

ANGIOSPERM PHYLOGENY-I

Study of the diagnostic features, salient vegetative and floral characteristics and economically important plants of following families:
Magnoliaceae

Malvaceae

Rutaceae

Euphorbiaceae
Capparidaceae

Fabaceae

SECTION C ANGIOSPERM PHYLOGENY-II

Study of the diagnostic features, salient vegetative and floral characteristics and economically important plants of following families: Apiaceae Amaranthaceae

Apocyanaceae

Acanthaceae

Lamiaceae

SECTION D ANGIOSPERM PHYLOGENY-III

a.) Study of the diagnostic features, salient vegetative and floral characteristics and economically important plants of following families:

Poaceae

Asclepiadaceae

Solanaceae

Liliaceae

Arecaceae

References Books and Readings:

1. Jones, A.B. and Luchsinger, A.(1979). *Plant Systematics*. New York: McGraw-Hill Book Co.
2. Shukla Pritiand Misra.(1988).*Taxonomy of Angiosperms*, New Delhi: Vikas Publishing House.
3. Hutchinson, J.(1959).*The families of Flowering Plants*.Oxford: Clarendon Press.
4. Davis, P.H. and Heywood,V.H.(1963).*Principles of Angiosperm Taxonomy*.London:
5. Oliver and Boyd.
6. Heywood, V.H. and MooreD.M.(1984).*Current concepts in Plant Taxonomy*. London: Academic Press.
7. Singh, G. (1999). *Plant Systematics: Theory and Practice.*New Delhi: Oxford and IBH Pvt. Ltd., New Delhi.
8. Stace, C.A. (1989).*Plant Taxonomy and Biosystematics (2nd Ed.*). London: Edward Arnold.
9. Singh V. andJain,D.K.(2005).*Taxonomy of Angiosperms*. Meerut.Rastogi Publications.
10. Kochhar S.L.(1981).*Economic Botany in the Tropics*. Delhi: MacMillan India Ltd.
11. Vashista P.C. (1980).*Taxonomy of Angiosperms*.New Delhi: Sultan Chand & Co.
12. Lawrence, G.H.M. (1950).*Taxonomy of Vascular Plants*. London: MacMillan.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	3	----	----	----	----	2	2	2	2	3	1	1
CO2	2	1	3	----	----	----	----	2	2	2	2	3	1	1
CO3	2	1	3	----	----	----	----	2	2	2	2	3	1	1
CO4	2	1	3	----	----	----	----	2	2	2	3	3	1	1

Course Title/Code	**Plant Systematics and Angiosperm Phylogeny Lab (EDH301-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**(0-0-2-0)**	
Credit	**1**	
Objectives	• **To acquaint students with the technical terms and identification keys for describing and identifying angiosperms.**	
Course Outcomes (COs)		**Mapping**
CO1	**To acquaint students with the technical terms and identification keys for describing and identifying angiosperms.**	**Skill Development/ Employability**
CO2	**To familiarize the students with local plants belonging to families included in the study (only those avaiLable during the season).**	**Employability**

CO3	**To enable the students to describe the vegetative and floral characteristics, draw floral diagram and write floral formulae of angiosperms.**	**Skill Development**
CO4	**To develop the skill of undertaking field study and preparing herbarium sheets.**	**Employability /Skill Development**
Prerequisites (if any)	**------**	

1. To identify common taxa using taxonomic keys.
2. Detailed study of at least one plant specimen per family as given in theory sylLabus.
3. Field study (3-5 days) to a nearby forest, for collection, identification and submission of 5 herbarium sheets.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	3	-	-	1	-	2	2	1	-	3	--	3
CO2	1	1	2	-	-	-	1	2	2	1	1	3	-	3
CO3	1	1	2	--	-	-	-	2	2	-	1	3	-	3
CO4	1	2	2	-	-	-	-	1	2	1	1	1	-	2

Course Title/Code	**Multivariate Calculus & Vector Calculus (MAH 350- T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**4**	
Course Objective	**Students shall be able to understand and apply the concept of multiple integral, improper integral and vector calculus.**	
Course Outcomes (COs)		**Mapping**
CO1	**Apply change of variables, change of order of integration involving double and triple integrals.**	**Skill Development**
CO2	**Apply the concept of triple integral to evaluate volume of region.**	**Skill Development**
CO3	**Analyse problems related to improper integrals.**	**Skill Development**
CO4	**Explain physical meaning of gradient of a scalar field, curl and divergence in terms of fluid flow and also be able to evaluate line integrals, surface integrals and volume integrals**	**Skill Development**

CO5	**Solve & analyze the Mathematical problems related to Integral calculus & vector calculus and its applications using mathematical software.**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of sets and real number system.**	

Section A

Multiple Integrals: Definition of a line integral and basic properties, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Definition of a triple integral, Evaluation, Volume as a Triple integral.

Section B

Improper Integral: Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula.

Section C

Vector Differentiation: Limit & Continuity of vector functions, differentiation of vector functions, tangent and normal components of vector functions, vector fields and scalar fields, gradient of a scalar field and directional derivative. Divergence and Curl of a vector field and their physical interpretations, Irrotational and Solenoidal fields. Laplacian operator.

Section D

Vector Integration: Integration of vector functions Line integral, Integrals independent of path, Surfaces in space, Surface integral, Volume integral, Gauss Divergence theorem, Stoke's theorem and Green's theorem.

Recommended Books:

1. Calculus by Lipman Bers, Vols 1 and 2, Holt Rinehart and Winston publishers.
2. First Course in Calculus by Serge Lang, Springer.
3. Calculus – Single and Multivariable by Hughes Hallet, Wiley.

4. Calculus by Thomas and Finny, Pearson

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	3	1	----	----	----	----	----	----	----	3	----	----
CO2	3	1	3	1	----	----	----	----	----	----	----	3	----	----
CO3	3	1	3	1	----	----	----	----	----	----	----	3	----	----

Course Title/Code	**Multivariate Calculus & Vector Calculus (MAH 350- P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**4**	
Course Objective	**Students shall be able to understand and apply the concept of multiple integral, improper integral and vector calculus.**	
Course Outcomes (COs)		**Mapping**

CO1	**To develop proficiency with the differentiation and integration of functions involving multiple variables as well as applications in the real world.**	**Skill Development**
CO2	**To develop problem solving among students based on multivariable calculus of real and vector functions.**	**Skill Development**
CO3	**To apply the principles of vector calculus and multivariable calculus to real world problems.**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of sets and real number system.**	

List of Experiment

1.To find the Eigen values and Eigenvectors of a square matrix.

2. Evaluation of Single integral (Definite & Indefinite) and its application.

3 Evaluation of Double integral and its application.

4. To study limit, continuity and differentiability of a vector point function.

5. To find the gradient of of a scalar point function.

6. To find the divergence and curl of a vector point function.

7. To find the work done using line integral of a vector point function.

8. To find surface and volume integral of a vector point function.

9. To verify Divergence theorem , Green’s theorem and Stoke’s theorem

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	3	1	----	----	----	----	----	----	----	3	----	----
CO2	3	1	3	1	----	----	----	----	----	----	----	3	----	----
CO3	3	1	3	1	----	----	----	----	----	----	----	3	----	----

Course Title/Code	**Ecology and Animal Behavior (EDH302-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-0-0-0**
Credits	**3**
Course Objective	**To enable students to understand the energy sources, flow of energy and conservation; to understand the recycling of minerals and nutrients in ecosystems; to understand the dynamics of population; to understand causes of pollution and suggest measures; to understand behavioral patterns in animals**
Course Outcomes (COs)	**Mapping**

CO1	**To understand the concept of population dispersal and distribution pattern**	**Skill Development**
CO2	**To understand the dynamics of community Diversity**	**Skill Development**
CO3	**To understand the dynamics of Ecosystem**	**Employability**
CO4	**. To develop understanding of the animal behaviour**	**Skill Development**
CO5	**To understand the evolution of society**	**Entrepreneurship & Skill Development**
CO6	**To develop the understanding of biological rhythm**	**Skill Development**
Prerequisites (if any)		

Section A COMMUNITY

Population- Unitary and modular populations, its unique and group attributes- population density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio. Population dispersal and distribution patterns.Characteristics of community diversity, diversity index, types of biodiversity species richness, abundance, species area relationship, community stratification, ecotone/edge effect, succession, stages of primary succession, climax community.

SECTION B

Dynamics of Ecosystem

a) Food chains, food web, trophic levels, grazing and detritus type of food chain, Y- shaped food chain in forest, one example of food web- Terrestrial or Aquatic, Nutrient cycle.

b) Ecological pyramids (review), energy flow in ecosystem, productivity; Biogeochemical cycle – nitrogen, phosphorus and sulphur cycles; recycling of organic nutrients.

c) Application of the study of ecology in wild life conservation and sustainable development.

SECTION C

Animal behaviour

a) Concepts and patterns of behaviour, Contributions of Lorenz, Tinbergen and C V Frisch, Instinct and learning, types of learning,
b) Genetic basis of behaviour, Control of behaviour, Neural control, Hormonal control.
c) Concept of motivation and releaser in behaviour; Innate behaviour, taxes, reflexes.

SECTION D

a) Social organization, Communication, Living in groups, Evolution of sociality. Study of interspecific association between cattle and egrets. Social behaviour in birds and primates ;
Aggressive behavior; Control of behavior.

b) Habituation in earthworms/mosquito larvae, biological rhythms and biological clock

References Books and Readings:

1. Fundamentals of Ecology by E.P. Odum – W.B. Saunders, Philadelphia).
2. Environmental Studies by S.V.S. Rana – (Rastogi Publications, 2008).
3. Animal Ecology by S.P. Singh, 6th Revised Edition – (Rastogi Publications,2008).
4. Basic Ecology by E.P Odum (Holt, Rinehart & Winston, New York).
5. Ecology by S.K.Charles – (Prentice Hall Of India, New Delhi)
6. Animal Behaviour by V.G.Dethier and E Stellar -(Prentice hall of India, NewDelhi) Current Problems in Animal Behaviour by W.H. Thorpe and L.Zangwill
7. Experimental Animal Behaviour-A selection of Lab. Exercises by H Hansell and JJ Aitken – (Blakie& Sons, Glasgow)
8. The study of Instinct by N Tinbergen.
9. The Dancing Bees by K V Frisch
10. Learning and Instincts in Animals by W H Thorpe and W Homan.
11. Animal behaviour: An evolutionary approach by AICOK J (1984) – Sinauer Associates.
12. Ecology: Principles and Applications by Chapman E (1988) – Cambridge University Press.
13. Modern Concept of Ecology by Kumar HD (1986) – Vikas Publishing House.
14. Ecology and Environment by Sharma PD (1991) – Rastogi Publications.
15. Environmental Biology by Trivedi PR &Gurudeep Raj (1992).

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO2	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO3	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO4	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO5	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO6	2	1	2	----	3	----	----	2	1	1	1	3	3	3

Course Title/Code	**Ecology and Animal Behavior Lab/(EDH302-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To enable students to develop the skills of studying animal behaviour patterns**	
Course Outcomes (COs)		**Mapping**
CO1	**To enable students to understand Animal adaptation in different habitats**	**Skill Development**
CO2	**To enable students to study Collection and qualitative and quantitative analysis of soil organisms**	**Skill Development**
CO3	**To enable students to study Estimation of dissolved oxygen, alkalinity and salinity in the pond water**	**Skill Development**
CO4	**To enable students to study Experiments with maze for studying behavioural motivation**	**Skill Development & Employability**
Prerequisites (if any)	**-----**	

Estimation of dissolved oxygen in the pond water.
Estimation of dissolved alkalinity in the pond water.
Estimation of dissolved salinity in the pond water.
Gut content analysis in fish.
Qualitative analysis of marine plankton to identify the most common mero- andholo- plankton.
Identification of the most common benthos, and Nekton in aquatic environment (marine and fresh water).
Population study of Local insects and ciliates in the culture medium for growthpattern (logistic and exponential curves).
Collection and qualitative and quantitative analysis of soil organisms – Depictionof histogram and pie diagram.
Animal adaptation in different habitats- Study of specimens: a) Morphologicalb) physiological adaptation with respect to excretion
Study of Preferences, a) Preening behaviour in birds, b) Photo–, chemo–, andGeotaxes in Drosophila (Project work). Stimuli eliciting aggressive displays in male Siamese fighter fish; b) colour change in female Siamese fighter fish (demonstration).
Experiments maze for studying behavioural motivation in rat. Field Visit- Lake or pond

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	-	-	2	1	-	-	-	-	1	--	--
CO2	1	1	2	-	-	-	2	-	-	--	-	1	-	-
CO3	1	-	2	--	-	2	1	-	-	-	-	1	-	-
CO4	-	2	3			1	2	--	-	-	-	1	-	-

Course Title/Code	**Cell Biology and Genetics EDH303-T**
Course Type	**Core**
Course Nature	**Hard**

L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**After going through this course, the learner will be able to understand the structural complexity of a eukaryotic cell and understand the structure and function of various cell organelles**	
Course Outcomes (COs)		**Mapping**
CO1	**To understand the structural complexity of a eukaryotic cell**	**Skill Development**
CO2	**To understand the structure and function of various cell organelles**	**Skill Development**
CO3	**To get acquainted with the structure and significance of nucleus and chromosomes**	**Employability**
CO4	**To review Mendelian inheritance in the light of gene interactions**	**Entrepreneurship**
Prerequisites (if any)	**Basic knowledge of Biological Science**	

SECTION A

Cell and Cell organelles

a) Ultrastructure of Prokaryotic and Eukaryotic cells.

b) Ultrastructure and functions- Cell wall, Plasma membrane, Golgi complex, Endoplasmic reticulum, Mitochondrion, Microbodies.

c) **Nucleus** –Ultrastructure of eukaryotic nucleus.

SECTION B

a.) Ultrastructure and functions- Chloroplast, Ribosome, Lysosome and

b.) Cell Division: Cell-cycle, events of cell division (karyokinesis, cytokinesis)

c.) Mitosis, Meiosis and their significance.

SECTION C

Genetics and Inheritance of genes:

a) Mendelism – Review of Mendel's laws of inheritance

b) Solving problems related to Mendel's laws.

c) Incomplete dominance, complementary gene action (flower colour in sweet pea).

d) Supplementary gene action (coat colour in mice),

SECTION D

a) Epistasis (fruit colour in summer squash)

b) Multiple factor inheritance (ear size in maize).

c) Sex determination in plants – *Melandrium.*

d) **Cytoplasmic inheritance** –plastid inheritance in *Mirabilis*

e) *C*ytoplasmic male sterility in maize. **References Books and Readings:**

1. Snustad, D.P. and Simmons, M.J.(2000).*Principles of Genetics*. USA: John Wiley & Sons, Inc.

2. Gupta, P.K.(1999).*A Textbook of Cell and Molecular Biology*.Meerut: Rastogi Publications.

3. Wolfe,S.L. (1993).*Molecular and Cell Biology*.California: Wadsworth Publishing Co.

4. Harris, N. and Oparka,K.J.(1994). *Plant Cell Biology: A Practical Approach*.Oxford: IRL Press, Oxford Univ.Press.

5. Singh, S.P. and Tomar,B.S.(2006).*Cell Biology*, Meerut: Rastogi Publications.
6. Gupta, P.K. (2005).*Elements of Genetics*. Meerut: Rastogi Publications. 7. Gardner, A. (1990).*Principles of Genetics (6th Ed.)*. USA: John Wiley & Sons Inc.
8. Gupta P.K. (2000).*Cytology, Genetics and Evolution*. Meerut: Rastogi Publications.

9. Atherly, A.G., Girton, J.R. and MacDonald,J.F.(1999).*The Science of Genetics*. Fortworth: Saunders College Publishing.

10. Russel,P.J. (1998). *Genetics*. USA: The Benjamin/Cummings Publishing Co. Inc.

11. Gunning, B.E.S. and Steer, M.W.(1999).*Plant Cell Biology, Structure and Function*. Massachusettes: Jones & Bartlett Publishers.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	----	3	----	----	2	1	1	1	**3**	**3**	**3**
CO2	2	1	2	----	3	----	----	2	1	1	1	**3**	**3**	**3**
CO3	2	1	2	----	3	----	----	2	1	1	1	**3**	**3**	**3**
CO4	2	1	2	----	3	----	----	2	1	1	1	**3**	**3**	**2**

Course Title/Code	**Cell Biology and Genetics Lab (EDH303-P)**
Course Type	**Core**
Course Nature	**Hard**

L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To develop skills of staining cells and observing cell organelles and prepare temporary and permanent cytological preparations of suitable plant materials to study mitosis and meiosis.**	
Course Outcomes (COs)		**Mapping**
CO1	**To develop skills of staining cells and observing cell organelles**	**Skill Development**
CO2	**To prepare temporary and permanent cytological preparations of suitable plant materials to study mitosis and meiosis**	**Skill Development**
CO3	**To verify Mendelian laws of inheritance**	**Employability**
CO4	**. To understand the cell structure in details**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of Biological Science**	

Activities

1. Comparative study of cell structure in onion cells *Hydrilla* and *Chara*/*Spirogyra*.

2. Study of plastids to examine pigment distribution in plants (e.g. *Cassia*,

Lycopersicon and *Capsicum*)

3. Examination of electron micrographs of virus, bacteria, Cyanobacteria. and eukaryotic cells with special reference to organelles

4. Study of various stages of mitosis and meiosis by preparing slides of suitable plant materials (onion root tips and onion flower buds).

5. Working out genetic problems related to Mendelian laws of inheritance and interaction of genes.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	2	3	3	2	3	3	**1**	**-**	**2**
CO2	3	3	3	2	3	3	3	3	2	3	3	**2**	**2**	**-**
CO3	3	2	2	2	3	3	3	3	2	2	2	**-**	**1**	**1**
CO4	2	2	3	2	2	2	2	3	2	3	2	**-**	**3**	**-**

Course Title/Code	**Education in Contemporary India (EDH214-T)**

Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-0-0-0**
Credits	**3**
Course Objective	**This course aims to develop an understanding of education as an agenda for the nation state and its policy visions and efforts in evolving a national system of education. To keep up with new developments in the knowledge change and the curriculum shifts. Changing the way teachers teach students by adopting the latest methods and pedagogy. Emphasize vocational subjects, Science education, and Research.**

Course Outcomes (COs)		**Mapping**
CO1	**Discuss the concept of equality of opportunities in Education considering the constitutional provision.**	**Skill Development**

CO2	**Analyze Indian Constitutional provisions and directive principles relevant to Education along with key developments during pre-independence era.**	**Employability**
CO3	**Examine the role of NCF 2005, Right to Education Act 2009 and Yashpal committee report in the development of Indian Education system.**	**Skill Development**
CO4	**Explore the core structures of Indian education system and the role of educational agencies in its development.**	**Entrepreneurship**
CO5	**Review the role of teacher in universal and inclusive education in improving the quality in Education.**	**Entrepreneurship**
Prerequisites (if any)	**NA**	

Section A

E- learning for designing instruction – analysing context (classroom - physical & human resource; student sociological, psychological, physical perspective and for E- learning integration, unit planning & lesson planning E- learning for identifying and developing e-resources – e resources : Meaning and nature, types; concept of Open Educational Resources; Searching and identification of OERs based on licenses and
copyrights; process of developing e resources; use of e resources for effective classroom transaction E- learning for presentation and participation – Modes of presentation, interactive modes for enhancing students' participation, collaborative mode for enhancing learning process

Section B

Creating E- learning Ecosystem in the school for inclusive education– hardware, software – Free and Open Source Software(FOSS), connectivity; Assistive and adaptive technologies, E- learning for planning – Scheduling educational activities, ideating and organizing events E-learning for documentation and classroom management –Creation, storing, retrieval, manipulation and sharing of digital information E- learning tools/techniques for classroom management and communication with other stakeholders E-learning for Continuing professional development: MOOCs, e groups, forums etc for sustainable use of E- learning Social, ethical and legal issues of E-learning: security threats and measures, Cyberprivacy and Netiquette; ethical practices in cyber space; cyber laws and child safety

Reference Books and Readings

1. GOI. (1966). *Report of the Education Commission-1964-66*. New Delhi: Ministry of Education.
2. GOI. (1992*). National policy on education, 1986* (As modified in 1992). Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/NPE86-mod92.pdf
3. GOI (1993). *Learning Without Burden*. Report of the National Advisory Committee retrieved from http://www.teindia.nic.in/Files/Reports/CCR/Yash%20Pal_committe_report_lwb.pdf
4. GOI. (2009). The right of children to free and compulsory education act, 2009. Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/rte.pdf
5. Kashyap, S.C. (2009). *The constitution of India,* New Delhi: National Book Trust.
6. Mishra, B.K. &Mohanty, R.K. (2003). *Trends and issues in India Education,* Meerut: Surya publications.
7. Nambissan, G. B. (2009). *Exclusion and discrimination in schools: Experiences of dalit children*. Indian Institute of Dalit Studies and UNICEF.
8. NCERT. (2006). *Position paper-National focus group on problems of scheduled caste and scheduled tribe children (NCF2005).* New Delhi: NCERT
9. Rajput, J.S. (1994). *Universalisation of Elementary Education*, New Delhi: Vikas Publishing House.
10. Sachdeva,M.S. et.al (2011). *Philosophical, Sociological and Economic bases of Education*, Patiala: Twenty First Century Publications.
11. Shankar, M. (2007*). Contemporly issues in modern Indian education*, New Delhi: Authors Press.
12. Stormquist, N. P.(2002). *Education in a Globalised world.* New York: Rowman & Littlefield publishers.
13. Walia,J.S.(1979). *Modern Indian Education and its Problems,* Jalandhar City: Paul Publishers, Gopal Nagar.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	-	1	-	-	-	-	2	2	-	2	1
CO2	3	2	3	-	1	-	-	-	-	2	2	-	2	1
CO3	3	3	2	-	-	3	-	-	2	-	2	-	2	1
CO4	2	2	-	-	-	2	-	-	2	2	2	-	2	1
CO5	2	2	2	2	-	2	-	-	2	2	2	-	2	1

Course Title/Code	**Education in Contemporary India Lab (EDH214-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**0-0-2-0**
Credits	**1**
Course Objective	**This course aims to develop an understanding of education as an agenda for the nation state and its policy visions and efforts in evolving a national system of education. To keep up with new developments in the knowledge change and the curriculum shifts. Changing the way teachers teach students by adopting the latest methods and pedagogy. Emphasize vocational subjects, Science education, and Research.**

Course Outcomes (COs)	**Mapping**

CO1	**Review of recent articles, editorials, research papers etc. on emerging issues e.g. implementation of RTE/ Equal opportunities for all/ various govt. schemes for universalization of education, girl education/and modernization of education etc.**	**Employability**
CO2	**Analyze Indian Constitutional provisions and directive principles relevant to Education along with key developments during pre-independence era.**	**Employability**
CO3	**Compare the recommendations of National Curriculum framework 2005 and National Curriculum framework 2022**	**Skill Development**
CO4	**Explore the core structures of Indian education system and the role of educational agencies in its development.**	**Entrepreneurship**
CO5	**Review the role of teacher in universal and inclusive education in improving the quality in Education.**	**Entrepreneurship**
Prerequisites (if any)	**NA**	

Practical Activities

1. Collaboration with any NGO working for Marginalized groups, Conducting field visits, case studies, and participating in their projects.

2. Review of Mid-day meal programme in a particular rural area.

3. Review of recent articles, editorials, research papers etc. on emerging issues e.g. implementation of RTE/ Equal opportunities for all/ various govt. schemes for universalization of education, girl education/and modernization of education etc.

4. Group discussion on fundamental rights, duties and directive principles.

5. Debate on true women empowerment.

Reference Books and Readings

1. GOI. (1966). *Report of the Education Commission-1964-66*. New Delhi: Ministry of Education.
2. GOI. (1992*). National policy on education, 1986* (As modified in 1992). Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/NPE86-mod92.pdf
3. GOI (1993). *Learning Without Burden*. Report of the National Advisory Committee retrieved from http://www.teindia.nic.in/Files/Reports/CCR/Yash%20Pal_committe_report_lwb.pdf
4. GOI. (2009). The right of children to free and compulsory education act, 2009. Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/rte.pdf
5. Kashyap, S.C. (2009). *The constitution of India,* New Delhi: National Book Trust.
6. Mishra, B.K. &Mohanty, R.K. (2003). *Trends and issues in India Education,* Meerut: Surya publications.
7. Nambissan, G. B. (2009). *Exclusion and discrimination in schools: Experiences of dalit children*. Indian Institute of Dalit Studies and UNICEF.
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9. Rajput, J.S. (1994). *Universalisation of Elementary Education*, New Delhi: Vikas Publishing House.
10. Sachdeva,M.S. et.al (2011). *Philosophical, Sociological and Economic bases of Education*, Patiala: Twenty First Century Publications.
11. Shankar, M. (2007*). Contemporly issues in modern Indian education*, New Delhi: Authors Press.
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13. Walia,J.S.(1979). *Modern Indian Education and its Problems,* Jalandhar City: Paul Publishers, Gopal Nagar.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	1	-	-	-	-	2	2
CO2	3	-	3	-	1	-	-	-	-	2	2
CO3	3	3	-	-	-	3	-	-	2	-	2
CO4	2	-	-	-	-	2	-	-	2	2	2
CO5	-	2	2	2	-	2	-	-	2	2	2

Course Title/Code	**Pedagogy of Biological Science (EDH109-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-0-0-0**
Credits	**3**
Course Objective	**To focus on the various aspects of biological science like knowledge, understanding of science, nurturance of process skills, development of scientific attitude, scientific temper, nurturance of curiosity, creativity, and aesthetic sense, imbibing values, developing problem solving and relating biological science education with nature, social environment, technology, and society common at all educational processes.**

Course Outcomes (COs)		**Mapping**
CO1	**Understand and appreciate the nature of Science and contributions by eminent Biologists.**	**Skill Development**
CO2	**Design learning objectives for content related to Biological Sciences.**	**Skill Development**
CO3	**Explain a Constructivist approach of building knowledge.**	**Employability**
CO4	**Apply different pedagogical approaches to design lesson plans.**	**Entrepreneurship**

CO5	**Design effective assessment strategies related to Biological Sciences and ICT mediated online assessment sheets.**	**Entrepreneurship & Skill Development**
Prerequisites (if any)	**Basic knowledge of Biological Science**	

SECTION A NATURE OF SCIENCE

Introduction to Pedagogy: Concept; Cardinal Principles of Learning; Why study Science; What is Science? Science as a domain of inquiry and exploration. Scope of biological sciences for understanding the diversity of the living world, origin of life and its evolution. History of Biological Sciences. Some Eminent Biologist's contributions and reflections on society: William Harvey, Lamarck, Charles Darwin, Rosalind Franklin, M.S. Swaminathan. Recent advancements and research in biological sciences. An illustration of how children learn science?

SECTION B AIMS AND OBJECTIVES OF LEARNING BIOLOGICAL SCIENCES

Aims of learning Sciences, Development of scientific attitude and scientific temper- Respect for evidence, open mindedness, Truthfulness in reporting observation, Critical thinking, logical thinking, Skepticism, objectivity, Nurturing the natural curiosity, creativity, and Aesthetic sense.

Meaning of learning objectives, Developing learning objectives; Anderson and Krathwohl's Taxonomy. Writing learning objectives: Remembering, understanding, Applying, Analysing, Evaluating, Creating. Learning objectives from a Constructivist perspective.

SECTION C PEDAGOGICAL SHIFTS IN BIOLOGICAL SCIENCES

Pedagogical Shift: biological science as a fixed body of knowledge to the process of Constructing Knowledge, nature of science, knowledge, learners, learning and teachers, assessment, science curriculum and planning. Democratizing science learning: Critical Pedagogy. Need of Inclusion in science curriculum, approaches, ICT and professional development of teachers (*with special reference to Reflective practices and its role*).

Content cum methodology: concept and nature, steps to content cum methodology, pedagogical analysis (any three topics). Approaches and Strategies of learning Biology: Expository approach, investigation, projects, peer interactions, colLaborative approach, experiential learning, concept mapping and self-learning.

SECTION D

ASSESSMENT OF LEARNING

Development of Assessment Framework. CCE, Diagnostic tests, remedial/enrichment measures and monitoring learner's progress, Learner's record in biological sciences: Laboratory investigation, reports of field visits and excursions, projects work, portfolio, Assessment through participation in colLaborative learning: peer interaction, group discussions, seminars and presentations, Assessment through creative expression: Essays, posters, Drama, poetry, riddles etc. Assessment as a reflected process and as a reflecting process, Recording and reporting of learning evidences/outcome: measurement of student's achievement- marks and grading.

References Books and Readings

1. CBSE (2009). Teacher's manual on CCE. New Delhi: CBSE.
2. Chikara, M.S. and S. Sarma (1985). *Teaching Biology*. Ludhiana: Prakash Brothers.
3. Das, R.C. (1985). *Science teaching in Schools.* New Delhi: Sterling Publications Private Ltd.
4. Krathwohl, D.R., Bloom B.S. and Maria B.B. (1964). *Taxonomy of Educational Objectives, Handbook II, Affective Domain,* New York: David McKay.
5. L. Steffe and J. Gale (Eds.) 1995). *Constructivism in Education*, New Jersey: Lawrence Erlbaum Associates Inc.
6. Lindfors, J. (1984). *How do children learn or how do teachers teach? A Profound confusion*: Language Arts, 61 (6), 600-606.
7. National Curriculum Framework 2005, NCERT, New Delhi.
8. Ramakrishna, A. (2012). *Methodology of Teaching Life Sciences*. New Delhi: Pearson.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	2	2	3	2	3	3	2	3	2
CO2	2	2	3	2	2	2	2	3	2	3	3	2	3	2
CO3	3	2	2	2	3	3	3	3	2	2	2	2	3	2
CO4	3	3	3	2	3	3	3	3	2	3	3	2	3	2

CO5	2	2	3	2	2	2	2	3	2	3	3	2	3	2

Course Title/Code	**Pedagogy of Biological Science Lab (EDH109-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**0-0-2-0**
Credits	**1**
Course Objective	**To focus on the practical aspects of learning the pedagogy of biological science such as preparing instructional objectives as per Bloom's Taxonomy, develop micro lesson plans for various micro teaching skills, prepare lesson plan for teaching biological science, preparing concept maps, and constructing a test for students' evaluation and assessment.**

Course Outcomes (COs)		**Mapping**
CO1	**Understand the Bloom's Taxonomy of Instructional Objectives and design learning objectives for content related to Biological Sciences.**	**Skill Development**
CO2	**Understand the micro teaching skills and prepare the micro lesson plans for each skill.**	**Skill Development**

CO3	**Learn about the Herbartian lesson plan and prepare the lesson plans for teaching Biological Science.**	**Employability**
CO4	**Apply different pedagogical approaches to design lesson plans.**	**Entrepreneurship**
CO5	**Learn about the test construction and construct a test paper for students' assessment.**	**Entrepreneurship & Skill Development**
Prerequisites (if any)	**Basic knowledge of Biological Science**	

1. Critical review of a Textbook of Science/ Biology.
2. Planning and conducting awareness programs/ camps.
3. Diagnosis and preventive measures of Epidemics.
4. Report of one Action Research carried out in the practicing school.
5. Concept mapping in selected units in Biological Sciences Planning learning situations for constructing knowledge in Biological Sciences.
6. Group Discussion on pedagogical issues.
7. *Hands-on experience through visits to botanical gardens/ flower shows/ garden of five senses/Department of Science Education at NCERT/SCERT.
8. Report on measures being taken for inclusive teaching-learning in practicing schools.
9. Exploration of alternative conceptions held commonly by students and planning of approaches towards re-conceptualizations – Project

*Field activity

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO2	PSO3
CO1	2	2	3	2	2	2	3	3	2	3	3	2	3	2

CO2	3	3	3	2	3	3	3	3	2	3	3	2	3	2
CO3	3	2	2	2	3	3	3	3	2	2	2	2	3	2
CO4	2	2	3	2	2	2	2	3	2	3	2	2	3	2
CO5	2	2	3	2	2	2	2	3	1	3	1	2	3	2

Course Title/Code	**Pedagogy of Mathematics (EDH110-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-0-0-0**
Credits	**3**
Course Objective	**To enable the students, acquire desirable knowledge and skills pertaining to various pedagogical aspects concerning teaching of Mathematics.**

Course Outcomes (COs)		Mapping
CO1	**To appreciate the role and contribution of eminent mathematicians.**	**Employability**
CO2	**To develop correlation of mathematics with other subjects**	**Employability**
CO3	**To design instructional objectives for chosen content.**	**Skill Development**
CO4	**Apply innovative methods of teachings to teach mathematics at middle school level.**	**Entrepreneurship**
CO5	**Create content appropriate evaluation tools in mathematics.**	**Entrepreneurship**
CO6	**To reflect the skill set of an effective mathematics teacher in the classroom.**	**Skill Development**
Prerequisites (if any)	**NA**	

SECTION A

NATURE OF MATHEMATICS

Meaning, Nature, Importance and Value of Mathematics. Axioms, Theorem, Postulates, Assumptions and Hypothesis in Mathematics. Historical Development of Notations and Number Systems. Contribution of Mathematicians (Ramanujam, Aryabhata, Bhaskar Acharya, Euclid, Pythagoras). Perspectives on Psychology of Teaching and Learning of Mathematics- Constructivism, Enactivism, Vygotskyian Perspectives, and Zone of Proximal Development

OBJECTIVES AND INSTRUCTIONAL PLANNING IN MATHEMATICS

Aims and Objectives of Teaching Mathematics in Elementary and Secondary Schools. Bloom's Taxonomy of Educational Objectives and Writing Objectives in Behavioural Terms. Lesson Planning– Importance and Basic Steps. Planning Lesson of Arithmetic, Algebra and Geometry. Unit Planning – Format of A Unit Plan Pedagogical Analysis: Meaning and Need and Procedure for Conducting Pedagogical Analysis. Classification of Content, Objective, Evaluation, etc.

SECTION B

STRATEGIES FOR LEARNING AND TEACHING MATHEMATICS

Concept Formation and Concept Attainment: Concept Attainment Model for Learning and Teaching of Concepts. Learning By Exposition: Advance Organizer Model. Methods of Teaching- Lecture, Discussion, Demonstration, Inductive-Deductive, AnalyticSynthetic, Problem-Solving, Heuristic and Project. Techniques of Teaching Mathematics: Oral Work, Written Work, Drill-Work, Brain- Storming and Computer Assisted Instruction (CAI)

Creating Different Situations of Learning Engagement: Group Learning, Individual Learning, Small-Group, Cooperative (PeerTutoring, Jigsaw, etc.), and Situational/ Contextual Learning.

SECTION C TEACHING-LEARNING RESOURCES IN MATHEMATICS FOR STUDENTS WITH DISABILITIES

Mathematics Laboratory- Concept, Need, and Equipment for Setting up a Mathematics Laboratory. Utilization of Learning Resources in Mathematics: Charts and Pictures, Weighing and Measuring Instruments, Drawing Instruments, Models, Concrete Materials, Surveying Instruments with Reference to Diverse Learners. Bulletin Boards and Mathematics Club Abacus, Cussionaire Rods, Fractional Discs, Napier Strips, Calculators, Computers, Smart Boards, Multimedia Presentations, and Special Aids and Appliances for Diverse Learners.

SECTION D ASSESSMENT AND EVALUATION FOR MATHEMATICS LEARNING

Assessment and Evaluation- Concept, Importance and Purpose. Error Analysis, Diagnostic Tests, Identification of Hard Spots and Remedial Measures. Tools and Techniques for Formative and Summative Assessments of Learner Achievement in Mathematics, Comprehensive and Continuous Evaluation in Mathematics. Preparation of Diagnostic and Achievement Test.
Action Research- Meaning, Steps, Its difference with Fundamental Research, Critical evaluation of the curriculum in use in Mathematics at the secondary stage according to NCF. Adaptations in Evaluation Procedure for Students with Diverse Learning Styles.

Reference Books and Readings

1. Carey, L.M. (1988). Measuring and Evaluating School Learning, Boston: Allyn and Bacon.
2. Chambers, P. (2010).Teaching Mathematics, Sage Publication, New Delhi.
3. Chapman, L.R. (1970). The Process of Learning Mathematics, New York: Pregamon Press.
4. David, A.H., Maggie, M.K., & Louann, H.L. (2007). Teaching Mathematics
5. Meaningfully: Solutions for Reaching Struggling Learners, Canada: Amazon Books.
6. David, W. (1988). How Children Think and Learn, New York: Blackwell Publishers Ltd.
7. Gupta, H. N., & Shankaran, V. (Ed.), (1984). Content-Cum-Methodology of Teaching Mathematics. NCERT, New Delhi.
8. James, A. (2005). Teaching of Mathematics, New Delhi: Neelkamal Publication.
9. Kumar, S. (2009). Teaching of Mathematics, New Delhi: Anmol Publications.
10. Mangal, S.K. (1993). Teaching of Mathematics, New Delhi: Arya Book Depot.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	2	2	3	2	3	3	2	3	2
CO2	2	2	3	2	2	2	2	0	2	3	3	2	3	2
CO3	2	2	3	2	2	2	2	3	2	3	3	2	3	2
CO4	2	2	3	2	3	2	2	3	2	3	3	2	3	2

CO5	2	2	3	2	2	2	2	3	2	3	3	2	3	2
CO6	3	3	3	2	2	2	2	3	2	3	3	2	3	2

Course Title/Code	**Pedagogy of Mathematics Lab (EDH110-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**0-0-2-0**
Credits	**1**
Course Objective	**To enable the students, acquire desirable knowledge and skills pertaining to various pedagogical aspects concerning teaching of Mathematics.**

Course Outcomes (COs)		Mapping
CO1	**Develop Lesson Plan incorporating the core components.**	**Skill Development**
CO2	**Make use of innovative methods of teachings to teach mathematics at middle school level.**	**Entrepreneurship**
CO3	**Design appropriate evaluation tools for effective evaluation of learning of Mathematical concepts.**	**Entrepreneurship**
CO4	**To demonstrate skill set of an effective Mathematics teacher in the classroom.**	**Skill Development**
Prerequisites (if any)	**NA**	

Practical Activities

1. Pedagogical analysis of a unit of content from secondary school Mathematics SylLabus
2. Critically evaluate the present curriculum in mathematics at the secondary stageaccording to NCF
3. Preparation of a multimedia presentation on a topic with special reference to students with disabilities
4. Construction of a question paper based on current CBSE format/concerned State Board of education, preparing its Scoring key, and marking scheme
5. Analyzing errors committed by school children in Mathematics and preparing a remedial plan
6. Developing an Action Research proposal for a problem related to teaching and learning of Mathematics with reference to students with disabilities
7. Prepare an achievement test of mathematics

8. Develop a multimedia lesson plan using appropriate ICT resources and transactingthe same in class
9. Prepare teaching aid for teaching of mathematics at secondary school level
10. NTeQ Model in Mathematics

Reference Books and Readings

1. Mani, M. N. G. (1992). Techniques of Teaching Blind Children, New Delhi: Sterling Publishers.
2. Mukhopadhyaya, S., Jangira, N. K., Mani, M.N. G., & Raychaudhary, N. (1987).
3. Sourcebook for Training Teachers of Visually Handicapped, New Delhi: NCERT.
4. Nemeth, A. (1973). Nemeth Code for Mathematics and Scientific Notation,
5. Loviseville K: American Printing House.
6. Siddhu, K.S. (1990). Teaching of Mathematics, New Delhi: Sterling Publishers Keeley, P. K., & Cheryl, T. R. (2011).

Mathematics Formative Assessment, Canada: Sage Publications.

7. National Curriculum Framework. (2005). NCERT, New Delhi: NCERT.
8. National Curriculum Framework for Teacher Education. (2009). NCTE, New Delhi.
9. Teaching of Mathematics (ES-342), Blocks 1-4. (2000). IGNOU, New Delhi.
10. Text Books of Mathematics for Class-VI to X. (2006). NCERT, New Delhi.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	--	2	1	--	3	--	3	3	2	3	2
CO2	2	--	--	2	3	2	2	--	2	1	3	2	3	2
CO3	2	2	1	2	--	1	2	3	--	3	3	2	3	2
CO4	1	1	3	--	2	--	2	--	--	3	3	2	3	2

Course Title/Code	**Yoga & Health Education (EDW304)**	
Course Type	**Core**	
Course Nature	**Workshop**	
L-T-P-0 Structure	**0-0-3-0**	
Credits	**1.5**	
Course Objective	**Student Readiness regarding Yoga and its benefits**	
Course Outcomes (COs)		**Mapping**
CO1	**Acquire knowledge of theoretical concepts of Yoga and Meditation in relation to holistic health**	**Employability**

CO2	**Apply knowledge of Yogic and meditation-based practices in developing sound physical and mental wellbeing**	**Skill Development**
CO3	**Develop their personality with a sense of identity and meaning through the practice of Meditation**	**Skill Development**
CO4	**Build awareness of the importance of Yoga and Meditation in educational context**	**Entrepreneurship**
Prerequisites (if any)		

SECTION A

YOGA – THEORETICAL FRAMEWORK

Yoga – History, Meaning, Need and Importance. The two schools of Yoga: Rāja Yoga and Haṭha Yoga. The streams of Yoga: Karma Yoga, Bhakti Yoga and Jñāna Yoga –main features and educational implications. Eight limbs of Yoga: Eyama, Niyama, Asana, Pranayama, Prathiyagara, Dharana, Dhiyana and Samathi. Meditation – Origin, Meaning and Types with focus on Mindfulness Meditation. Pranayama: Correct Breathing Exercise, Anulome-vilom, Surya-bhedhan and Bhramari.

SECTION B

YOGA AND HEALTH – EDUCATIONAL IMPLICATIONS

Holistic Health – Yogic Concept of Holistic Health and its Components. Yoga for developing concentration, creativity, coping with stress and anxiety. Meditation in classrooms for positive Mental Health, Role of Meditation and Spirituality in developing Identity, Sense of Meaning and Value in students' life

Reference Books and Readings

- Anantharaman, T.R. (1996). Ancient Yoga and Modern Science. New Delhi: Munshiram Manoharlal Publishers Pvt Ltd.
- Besant, A. (2005). An introduction to yoga, New Delhi: Cosmo.
- Bhogal, R.S. (2010). Yoga & Mental Health & Beyond. Lonavla: Kaivalyadhama SMYM Samiti • Goel, A. (2007). Yoga Education, Philosophy and Practice. New Delhi: Deep and Deep Publications.
- Nath, S.P. (2005). Speaking of Yoga. New Delhi: Sterling Publishers.
- NCERT. 2015. Yoga: A Healthy Way of Living, Secondary Stage, New Delhi.
- NCTE. 2015. Yoga Education-Bachelor of Education Programme, New Delhi.
- MDNIY. 2010. "Yoga Teachers Manual for School Teachers‖, New Delhi
- Mangal, S.K., Mangal,U.and Mana, S. K.(2009). Yoga education, New Delhi: Arya Publication.
- Nagendra, H.R. (1993). Yoga in Education. Banglore, Vivekananda Kendra.
- Taimini, I.K. (1979). The Science of Yoga. Madras, Adyar Publication.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	.....	.....	2	.....	2	2	2	3	1	2	2
CO2	2	2	3	.....	.....	2	.....	3	2	3	3	1	2	2
CO3	3	3	3	.....	.....	2	.....	3	2	3	3	1	2	2
CO4	3	3	3	.....	.....	2	.....	2	2	2	3	1	2	2

Course Title/Code	**Colloquium (EDN305)**
Course Type	**Core**
Course Nature	**NTCC**
L-T-P-0 Structure	**0-0-0-0**
Credits	**2**

Course Objective	The course aims at developing skill related to Communicative English	
Course Outcomes (COs)		Mapping
CO1	Identify the contemporary problems existing in society.	Skill development
CO2	Categorize the identified problem and relate it to different research genre.	Skill Development
CO3	Analyse the problem by reviewing the concepts.	Skill development
CO4	Suggest best possible solution to the identified problems	Skill development
Prerequisites (if any)		

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	------	------	------	------	------	3	2	3	1	3	2
CO2	2	3	1	------	------	------	------	------	3	2	3	1	3	2
CO3	2	3	1	------	------	------	------	------	3	2	3	1	3	2
CO4	3	3	1	------	------	------	------	------	3	3	3	1	3	3

Course Title/Code	Phase-1 Field Engagement (EDO209)

Course Type	**Core**
Course NAture	**Outcome**
L-T-P-0 Structure	**0-0-0-0**
Credits	**2**
Course Objective	**The purpose of the internship programme is to provide the students with the opportunity of undergoing a meaningful experience as practioner. Student is able to test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period**

Course Outcomes (COs)	**Mapping**

CO1	**Recognise the contribution of psychological, philosophical and socio - economic factors in optimizing teaching and learning**	**Skill Development**
CO2	**Articulate experiences of observing various components of the particular school set up as part of internship including the aspects of Infrastructure and Human Resources**	**Skill Development**
CO3	**Present the observations of internship period in a systematic and structured manner in the form of individual and/or Group Tasks**	**Skill Development**
CO4	**Appreciate importance of school engagement program as a integral component of teacher training programme**	**Skill Development**
CO5	**Demonstrate an understanding of the differences between government and private school settings and ways of functioning.**	**Skill Development**

Prerequisites (if any)	**NA**

Section A

Component 1- Observation of School Infrastructure (through schools' website) in light of policy recommendations with special focus on NEP 2020 in context of provisions for School Education

This will include visiting websites of selected schools to observe school infrastructure including Classrooms, Sports facilities, Assembly Hall, Laboratories, Auditorium etc.

Component 2 - Observation of the Schools teaching sessions (Mode- Videos uploaded on Govt. platforms)

Section B

Component 3 - Survey Study (Questionnaire and Interview of Schools teachers) pertaining to various dimensions of teaching learning process

Component 4 – Detailed presentation and viva based on above components

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	----	----	----	----	3	----	3	3	3	3	----	3	3
CO2	3	3	3	3	3	3	----	3	----	3	3	----	2	2
CO3	3	3	3	3	3	3	----	3	----	3	3	----	2	2
CO4	3	3	----	----	----	3	----	3	----	3	3	----	3	3

CO5	3	3	----	3	----	----	----	3	----	3	3	----	2	2

	SEMESTER - 6									
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/Workshop/ NTCC)**	**COURSE TYPE (Core/Elective /University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
CHH314-T	**Electrochemistry and Photochemistry**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
CHH314-P	**Electrochemistry and Photochemistry Lab**				**0**	**0**	**2**	**0**		
PHH331-T	**Relativity and Quantum Mechanics**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
PHH331-P	**Relativity and Quantum Mechanics Lab**				**0**	**0**	**2**	**0**		

EDH310-T	**Plant Physiology and Metabolism**	**EDU**			**3**	**0**	**0**	**0**	**5**	
EDH310-P	**Plant Physiology and Metabolism Lab**				**0**	**0**	**2**	**0**		
MAH320B	**GROUPS AND RINGS**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**4**	**4**
MAH321B-T	**COMPLEX ANALYSIS & NUMERICAL ANALYSIS**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
MAH321B-P	**COMPLEX ANALYSIS & NUMERICAL ANALYSIS Lab**				**0**	**0**	**2**	**0**		

EDH311-T	**Developmental Biology and Applied Zoology**	**EDU**			**3**	**0**	**0**	**0**	**5**	
EDH311-P	**Developmental Biology and Applied Zoology Lab**				**0**	**0**	**2**	**0**		
PHH432-T	**Atomic and Molecular Physics**	**APPLIED SCIENCE**	**HARD**	**CORE**	**3**	**1**	**0**	**0**	**6**	**4**
PHH432-P	**Atomic and Molecular Physics Lab**				**0**	**0**	**2**	**0**		
EDH128-T	**Pedagogy of Physical Sciences**	**EDU**	**HARD**	**CORE**	**3**	**0**	**0**	**0**	**5**	**4**
EDH128-P	**Pedagogy of Physical Sciences Lab**				**0**	**0**	**2**	**0**		
EDW104	**Reading And Reflection On Texts**	**EDU**	**WORKSHOP**	**CORE**	**0**	**0**	**3**	**0**	**3**	**1.5**

EDO314	Phase-II Field Engagement	EDU	OUTCOME	CORE	0	0	0	2	0	2
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				15(PCM)/12(ZBC)	4(PCM)/1(ZBC)	13(PCM)/11(ZBC)	2(PCM/ZBC)	34(PCM)/26(ZBC)	27.5(PCM)/19.5(ZBC)

Course Title/Code	**Electrochemistry and Photochemistry (CHH314-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	3	
Course Objective	**To give an in-depth exposure of Electrochemistry and familiarize the students with basic concepts of Photochemistry**	
Course Outcomes (COs)		**Mapping**
CO1	**Explain the nature of Electrolytic conduction involving theories of electrolytes.**	**Skill Development**
CO2	**Understand the processes that occur at electrodes and in electrolytes and to apply emf methods to study different types of reactions.**	**Skill Development**
CO3	**Describe the basic principles of battery design and understand the chemical reactions used in a lead-acid battery.**	**Skill Development**
CO4	**Explain and discuss theories for photoinduced electron transfer and excitation energy transfer, and apply these methods in quantitative calculations**	**Skill Development**
Prerequisites		

SECTION A ELECTROCHEMISTRY – I

To study the behaviour and reactions of ions in a variety of environments through the laws that govern them. Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

SECTION B ELECTROCHEMISTRY – II

Different types of reversible electrodes, Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen, sign conventions, electrochemical series and its significance.
To draw up a scheme for discussing the equilibrium position for an ionic reaction in terms of the electrode potential. Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells.

SECTION C ELECTROCHEMISTRY – III

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.
Definition of pH and pK_a determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods. Lead Battery, Ni-Cd cells, Fuel Cells, Hydrogen – Oxygen cell.

SECTION D PHOTOCHEMISTRY

Discussing the Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus – Drapper law, Stark – Einstein law, Jablonski diagram showing various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radioactive processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples), Chemiluminescence.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	2	1	-	3	3	3
CO2	3	3	3	3	-	-	-	-	2	1	-	---------	3	3
CO3	3	3	3	3	-	-	-	-	2	1	-	---------	3	3
CO4	3	3	3	3	-	-	-	-	2	1	-	---------	3	3

Course Title/Code	Electrochemistry and Photochemistry Lab (CHH314-P)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	0-0-2-0	
Credits	1	
Course Objective	To give an in-depth exposure of Electrochemistry and familiarize the students with basic concepts of Photochemistry	
Course Outcomes (COs)		Mapping
CO1	Explain the nature of Electrolytic conduction using different electrolytes	Skill Development
CO2	Understand the calculation of free energy change for an electrochemical cell using the measured cell potential value.	Skill Development
CO3	To be able to Measure the cell potential for an electrochemical cell.	Skill Development
CO4	Able to explain theory and practice of common photochemical and photophysical methods, and be able to execute these experimentally	Skill Development
Prerequisites		

Laboratory Techniques:

1. To study the effect of dilution on Molar Conductivity of weak and strong electrolytes.
2. Conductometric titrations
3. Construction and measurement of EMF of Cells.

Potentiometric Titrations

4. To measure the absorbance of $KMnO_4$ solution using Colorimeter
5. To measure the absorbance of $K_2Cr_2O_7$ solution using Colorimeter
6. To measure the absorbance of $K_2Cr_2O_7$ unknown solution using Colorimeter
7. To measure the absorbance of $KMnO_4$ unknown solution using Colorimeter

8. Crystallization: Benzoic acid from hot water, naphthalene from ethanol
9. Sublimation of camphor / phthalic acid/succinic acid
10. Preparation of *p*-bromoacetanilide from acetanilide by bromination

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	-	-	3	1	-	1	1	
CO2	3	2	3	3	-	-	-	-	3	1	-	2	1	1
CO3	3	2	3	3	-	-	-	-	3	1	-		2	1
CO4	3	2	3	3	-	-	-	-	3	1	-	1	1	2

Course Title/Code	**Relativity and Quantum Mechanics (PHH331-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**To enable students to understand the essentials of relativity and quantum mechanics, the two theories of 20th century.**	
Course Outcomes (COs)		**Mapping**
CO1	**Discuss and interpret the experiments that reveal the relativistic properties of matter.**	**Skill Development**
CO2	**Discuss and interpret the experiments that reveal the wave properties and particle properties of matter.**	**Skill Development**
CO3	**Understand the central concepts and principles in quantum mechanics, such as the Schrödinger wave equation, the wave function and their statistical interpretation.**	**Skill Development**
CO4	**Understand the basic building blocks of quantum behavior by correlating the classical statistical mechanics and various distributions.**	**Employability**
CO5	**Demonstrate an ability to conduct investigations of practical/technical issues consistent with their level of knowledge.**	**Employability**
Prerequisites (if any)	**Mathematical knowledge is required**	

Section A

Theory of Relativity

Galilean transformation and Newtonian relativity, Earth as an inertial frame of reference, Ether hypothesis, speed of light, Michelson-Morley experiment, Einstein's principle of relativity, Lorentz transformations - derivation, time dilation and length contraction, velocity addition theorem, variation of mass with velocity, relativistic momentum, energy and momentum conservation, relativistic energy, mass energy equivalence, examples from chemical and nuclear reactions, fission and fusion, Doppler effect in light.

Section B

Particles and Waves

Inadequacies in Classical Physics, Blackbody Radiation: Quantum Theory of Light, Photoelectric Effect, Compton Effect; Wave Nature of Matter : de Broglie Hypothesis, Wave-Particle Duality, Davisson-Germer Experiment, Wave description of Particles by Wave Packets, Group and Phase Velocities and Relation between them, Heisenberg's Uncertainty Principle: Derivation from Wave Packets.

Section C

Quantum Mechanics

Basic Postulates and Formalism: Energy, Momentum and Hamiltonian Operators, Time dependent and Time-independent Schrödinger Wave Equation, Properties of Wave Function, Interpretation of Wave Function, Probability Density and Probability, Normalization, Linearity and Superposition Principles, Eigen values and Eigen functions, Expectation Values, Wave Function of a Free Particle, Particle in a 1-Dimensional Box, 1-Dimensional Simple Harmonic Oscillator: Energy Levels and Wave Functions, Zero Point Energy

Section D

Quantum Statistics

Limitations of Classical Statistics, Phase Space, Phase Cells, Postulates of quantum statistics, indistinguishability, Bose-Einstein statistics – Derivation of distribution function, Application to Photon concept, Derivation of Planck's Radiation Formula. Elementary

idea of Bose-Einstein condensation. Fermi Dirac statistics – derivation of distribution function, Application of FD statistics to free electrons in metals – Fermi energy.

Text books:

(i) Mechanics, by Prof. D.S. Mathur, P.S. Hemne, S. Chand and Company Ltd.
(ii) Perspectives of Modern Physics, Arthur Beiser.
(iii) Introduction to Quantum Mechanics,Pauling and Wilson.
(iv) Statistical Mechanics, K Huang.
(v) David Griffiths, Introduction to Quantum Physics.
(vi) Quantum Physics by Ishwar Singh Tyagi (Pearson Publication)

Reference books:

(i) Halliday and Resnick, Physics
(ii) Introduction to Quantum Mechanics, 2nd Ed. by David J. Griffiths, Cambridge India, 2016.
(iii) Quantum Mechanics: Concepts and Applications, 2nd Ed. by Nouredine Zettili, Wiley India, 2016. (iv) Quantum Mechanics for Engineers by J.J. Sakurai

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	3	-	-	-	2	3	-	1	3	3	1
CO2	2	3	3	3	-	-	-	2	3	-	1	3	3	1
CO3	2	3	3	3	-	-	-	2	3	-	1	3	3	1
CO4	2	3	3	3	-	-	-	2	3	-	1	3	3	1
CO5	2	3	3	3	-	-	-	2	3	-	1	3	3	1

Course Title/Code	**Relativity and Quantum Mechanics (PHH331-P)**

Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To develop the ability to set up apparatus, collect data and to analyze the data for determining the desired physical quantity.**	
Course Outcomes (COs)		**Mapping**
CO1	**Demonstrate an ability to conduct investigations of practical/technical issues.**	**Employability**
Prerequisites (if any)	**Mathematical knowledge and experimental understanding of electronics components and their behaviour is required**	

The list of experiments is:

1. To determine the Planck's constant and work function of cathode material.
2. To determine the work function of cathode using thyratron valve.
3. To determine the energy band gap of a PN junction diode.
4. To determine the Hall coefficient and hence carrier concentration of a material.
5. To find the ionization potential and to verify the quantization of energy values.
6. To study the variation of magnetic field along the axis of a current carrying coil and hence to estimate the radius of the coil.
7. To study the V-I characteristics of a solar cell hence to find the fill factor.
8. To determine the wavelength of laser light using Plane transmission diffraction grating.

References:

1. Advanced Practical Physics- B. L. Worsnop and Flint.
2. Practical Physics- S. L. Gupta and V. Kumar
3. B. Sc. Practical Physics- Harnam Singh and P. S. Hemine
4. Advanced Practical Physics- Chauhan and Singh

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	3	-	2	-	3	3	2	1	3	1	2

Course Title/Code	**Plant Physiology and Metabolism (EDH310-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-0-0-0**
Credits	**3**

Course Objective	**This course aims to educate students about the mechanism and physiological life processes in plants. It focuses on the plant nutrient uptake and translocation, photosynthesis, respiration and nitrogen metabolism.**	
Course Outcomes (COs)		**Mapping**
CO1	**Recognise the water relationships of plants and transpiration**	**Skill Development**
CO2	**Understand the ascent of sap and transpiration.**	**Employability**
CO3	**Comprehend the process of absorption and mineral nutrition**	**Skill Development**
CO4	**Explain the process of photosynthesis and its significance.**	**Entrepreneurship**
Prerequisites (if any)	**Basic understanding of plant physiological processes**	

SECTION A

Water relations in plants

Importance of water to plant life, properties of water.

Review of diffusion, osmosis, and imbibition – definitions, concept of water potential, osmotic potential, pressure potential, solute potential, role of aquaporins (AQP).

Absorption of water: Root as an absorbing organ, mechanism, and pathways of water movement from root hair to root xylem - symplast, apoplast and trans-membrane pathways.

Ascent of sap: Vertical pathway of water in plants, structural properties of xylem, root pressure theory, cohesion – tension hypothesis.

Transpiration: Definition, types, mechanism of stomatal opening and closing (role of K^+ and Abscisic acid), anti-transpirants, factors and significance of transpiration, guttation.

SECTION B

Nutrition-Transport and Assimilation

Transport of Organic Substances: Ultrastructure and functions of phloem, (sieve tube), mechanism of phloem transport, source – sink relationship, theories and factors affecting photosynthesis.

Mineral Nutrition and Assimilation: Major and micro-nutrients, absorption of mineral salts, mechanism, and theories of mineral uptake; passive absorption – mass flow, Donnan's equilibrium: active absorption –carrier concept, cytochrome pump hypothesis. Role of N, P, K, Ca, Mg, Fe, N & Zn in metabolism.

SECTION C

Physiology of plant growth and development

Growth and Development: Definitions, phases of growth and development, photomorphogenesis, brief account of phytochromes– discovery, physiological role and mechanism of action.

Plant growth regulators: General account, discovery, chemical nature, physiological effects and applications of auxins, kinins, gibberellins, ethylene and abscisic acid. Brief account of plant movements.

Physiology of flowering and fruit ripening: (i) Brief account of photoperiodism, short day, long day and day-neutral plants, night interruption phenomenon, florigen concept, role of phytochromes, vernalization, role of growth hormones in flowering; Ripening of fruit.

SECTION D

Metabolism in Plants

Cellular Respiration: Introduction, respiratory quotient, aerobic and anaerobic respiration, structure of mitochondrion, glycolysis, synthesis of Acetyl CoA, Krebs cycle, oxidative phosphorylation, electron carrier complexes, chemiosmotic hypothesis, proton pump theory, synthesis of ATP (Paul Boyer's hypothesis), pentose phosphate pathway.

Photosynthesis: Introduction, ultrastructure of chloroplast, photosynthetic pigments, absorption and action spectra, photochemical (light) reaction, photophosphorylation, Z- scheme, Calvin cycle, C_4 pathway, CAM pathway, photorespiration, factors and significance of photosynthesis.

References Books and Readings:

- John, J.L. (1994). *Fundamentals of Biochemistry*. New Delhi: Sultan Chand & Co.
- Srivastava, H.S. (2005). *Plant Physiology, Biochemistry and Biotechnology*. Meerut: Rastogi Publications.
- Srivastava H.S. and N Shankar, N. (2006). *Plant Physiology and Biochemistry*. Meerut: Rastogi Publications.
- Taiz, L. and Zeiger, E. (1998). *Plant Physiology (2nd Ed.)*. USA: Sinauer Associates Inc.
- Salisbury, F.B. and Ross, C.W. (1992). *Plant Physiology (4th Ed.).* USA: Wadsworth Publishing Co.
- Leo, P.J. and R.C. Leegood, R.C. (1999). *Plant Biochemistry and Molecular Biology*. England: John Wiley & Sons.

- Hopkins, W.J. (1995). *Introduction to Plant Physiology*. New York: John Wiley and Sons, Inc.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	2	----	----	----	----	3	2	1	1	3	1	1
CO2	1	2	2	----	----	----	----	3	2	2	1	3	1	1
CO3	1	2	2	----	----	----	----	3	2	2	1	3	1	1
CO4	1	2	2	----	----	----	----	3	2	2	2	3	1	1

Course Title/Code	**Plant Physiology and Metabolism (EDH310-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**0-0-2-0**

Credits	**1**	
Course Objective	**The course will give knowledge about the various uptake and transport mechanisms in plants and coordinate the various processes, the role of various hormones, signalling compounds, thermodynamics and enzyme kinetics.**	
Course Outcomes (COs)		**Mapping**
CO1	**To understand the functioning of a plant from the physiological point of view.**	**Skill Development**
CO2	**To enable students to handle glassware and equipment for setting up physiology experiments.**	**Employability**
CO3	**To study responses of plants by manipulating the variables.**	**Skill Development**
CO4	**To study the role of N, P, K, Ca, Mg, Fe, N & Zn in plant metabolism.**	**Entrepreneurship**
Prerequisites (if any)	**Basic understanding of plant physiological processes**	

1. Preparation of different types of solutions – molal, molar, percent and normal solutions.
2. Determination of osmotic potential by plasmolytic method
3. Determination of water potential of potato tuber
4. Calculation of stomatal index, frequency and area of stomatal aperture in the 2 surfaces of leaves.
5. Determination the mechanism of stomatal opening and closing.
6. Demonstration of transpiration pull.
7. To study the impact of environmental factors on transpiration.
8. Demonstration of necessity of light, CO2 and Chlorophyll for photosynthesis
9. Separation of photosynthetic pigment using paper chromatography
10. Determination of osmotic potential by plasmolytic method 11. Determination the mechanism of stomatal opening and closing.
12. To study the impact of environmental factors on transpiration.

CO	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	2	3	3	2	3	3	-	1	1
CO2	3	3	3	2	3	3	3	3	2	3	3	-	2	1
CO3	3	2	2	2	3	3	3	3	2	2	2	-	2	1
CO4	2	2	3	2	2	2	2	3	2	3	2	-	2	2

Course Title/Code	**Group Theory (MAH3 51-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**3-1-0-0**
Credits	**4**
Course Objective	To equip the students with the concepts of advanced group theory and ring structure with their properties.
Course Outcomes (COs)	
CO1	Recognize the mathematical objects called groups & rings and apply the fundamental concepts of these algebraic structures
CO2	Explain the significance of the notions of cosets, normal subgroups, and factor groups and analyze consequences of Lagrange's theorem.
CO3	Illustrate structure preserving maps between different algebraic structures & its consequences.

CO4	Apply the basic concepts of ring of polynomials and irreducibility tests for polynomials over ring of integers.
CO5	Appreciate the significance of unique factorization in rings and integral domains
Prerequisites (if any)	

SECTION – A

Group Theory I: Groups, Examples, Properties and types, Sub-groups. Cyclic groups and properties, Cosets, Lagrange's theorem and its Consequences, Dihedral groups, Normal subgroups, Quotient groups.

SECTION B

Group Theory II: Homomorphism and Isomorphism of groups, Kernel of a Homomorphism, Fundamental theorem of Homomorphism, Cauchy's theorem for abelian groups, Permutation group, Alternating Group, Cayley's Theorem.

SECTION C

Ring Theory I: Rings, Integral Domains, Division Rings, Fields, Properties, Field of quotients. Ideals, Quotient rings Maximal, Prime and Principal ideals, Principal ideal ring, Divisibility in an Integral domain, Units and Associates.

SECTION D

Ring Theory II: Homomorphism of a ring, Kernel, Isomorphism, Fundamental theorem of Homomorphism, Polynomial rings, Divisibility, Irreducible polynomials, Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Unique Factorization Theorem, Eisenstein's Criterion of irreducibility.

References:

- Topics in Algebra by Herstein, Vikas.
- A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
- Modern Algebra by Vasishtha, Krishna Prakashan Media Pvt. Ltd.
- Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.
- Basic Abstract Algebra, 2nd Edition by P.B.Bhattacharya, S K Jain and S R Nagpaul, Cambridge University Press.
- Modern Algebra – An Introduction by Durban, 5th Edition, Wiley.
- Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.

- A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	2	----	----	2	1	2	----	2	2	----	----
CO2	2	3	1	2	----	----	2	1	2	----	2	2	----	----
CO3	2	3	1	2	----	----	2	1	2	----	2	2	----	----

Course Title/Code	**Group Theory (MAH3 51-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**0-2-0-0**
Credits	**4**
Course Objective	To equip the students with the concepts of advanced group theory and ring structure with their properties.
Course Outcomes (COs)	
CO1	Recognize the mathematical objects called groups & rings and apply the fundamental concepts of these algebraic structures
CO2	Explain the significance of the notions of cosets, normal subgroups, and factor groups and analyze consequences of Lagrange's theorem.
CO3	Illustrate structure preserving maps between different algebraic structures & its consequences.
CO4	Apply the basic concepts of ring of polynomials and irreducibility tests for polynomials over ring of integers.
CO5	Appreciate the significance of unique factorization in rings and integral domains
Prerequisites (if any)	

1. Linear Algebra using Maple.

2. Plots – 1 using Maple.

3. Plots – 2 using Maple.

4. Animations using Maple.

5. Creating Mathematical Documents – 1 using Maple.

6. Creating Mathematical Documents – 2 using Maple.

7. Listing elements of a permutation group using MAPLE's functions.

8. Listing elements of permutation groups without the cosets command.

9. Embedded Subgroups of a Symmetric Group and Cayley's Theorem

10. Cayley's Group Table.

11. Regular Permutation Representations.

LAB EXERCISE:

RECOMMENDED BOOKS:

1. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House.

2. M.K. Singhal& Asha Rani Singhal, Algebra, R. Chand & Co.

3. Surjeet Singh &QaziZameeruddin, Modern Algebra, Vikas publishing house.

List of Programs:

1. Introduction to Conditional statements –if and else using Octave 2.

Introduction to iteration-based programming – for loop using Octave

3. To find roots of an equation using Bisection method.
4. To find roots of an equation using Regula Falsi method.
5. To find roots of an equation using Newton Raphson method.
6. To find the value of a dependent variable for a given value of an independent variable using Lagrange’s interpolation method for a given set of data.

7. To find the value of a dependent variable for a given value of an independent variable using
8. Newton divided difference interpolation for a given set of data.
9. To find the value of a definite integral using Trapezoidal rule of integration.
10. To find the value of a definite integral using Simpson's 1/3 rule of integration.
11. To find the value of a definite integral using Simpson's 3/8 rule of integration.
12. To find the solution of an ordinary differential equation of first order by Euler's modified method.
13. To find the solution of an ordinary differential equation of first order by R-K method.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	2	----	----	2	1	2	----	2	2	----	----
CO2	2	3	1	2	----	----	2	1	2	----	2	2	----	----
CO3	2	3	1	2	----	----	2	1	2	----	2	2	----	----
CO4	2	3	1	2	-----	-----	2	1	2	-----	2	2	----	-----
CO5	-	-	-	-	-----	-----	2	------	-----	-----	-----	------	-----	-----

Course Title/Code	**Developmental Biology and Applied Zoology (EDH311-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**To enable students to comprehend the modern concepts of physiological aspects on various organs and systems of animals and human being; to comprehend chemical nature, biological molecules and physiological roles.**	
Course Outcomes (COs)		**Mapping**
CO1	**Explain the process of the development, organization and functions of developmental steps in mammals**	**Skill Development**
CO2	**To conceptualize the concept of the diversity and systemic complexity in neurulation and gastrulation**	**Skill Development**
CO3	**Analyse the developmental stages of chick embryo**	**Employability/Skill Development**
CO4	**To have the Knowledge of mechanism of regeneration**	**Skill Development**
CO5	**To have the knowledge of harmful animals and critically analyze the IPM**	**Entrepreneurship & Skill Development**
CO6	**To have the knowledge of harmful animals and critically analyze the IPM**	**Skill Development**
Prerequisites	**------**	

(if any)	

SECTION A

GAME TO GENESIS AND EARLY DEVELOPMENT

Historical perspective, aim and scope of developmental biology
Gametogenesis – Differentiation of spermatozoa and oocyte in mammals Different types of eggs, classification based on amount and distribution of yolk(deutoplasm)
Fertilization– approach and interaction of gametes, monospermy, polyspermy;
Parthenogenesis and its significance
Types of cleavage and fate map – Types of cleavages – holoblastic,meroblastic, radial, spiral, discoidal, superficial; planes of cleavages – meridional,vertical, equatorial, latitudinal.

SECTION B

DEVELOPMENT OF FROG AND REGENERATION

Gastrulation – Morphogenetic movement of cells, mechanism of gastrulation and change in cell shape
Neurulation– Formation, position and fate of three germinal layers, role of microtubules and microfilaments in neurulation
Primary organizer in frog – Organizer concept of Spemann, chemical nature and distribution of inductors – competence, determination and differentiation ; Outline of organogenesis ; metamorphosis of tadpole . c) Gastrulation in frog and chick up to the formation of three germ layers.

SECTION C

DEVELOPMENT OF CHICK AND MAMMAL

Development of Chick: Overview of early development; formation of primitive streak and germinal layers ; Salient features of chick embryos of 13 hrs, 19 hrs, 24 hrs, 33 hrs and 48 hrs of incubation ;
Foetal membranes – Development, structure and functions of a) amnion, b) chorion, c) yolk sac, d) allantois. Placenta in mammals – Structure, classification, physiology.
Concept of competence, determination and differentiation.
Regeneration: morpholaxis and epimorphosis; regeneration in Dugesia and salamander; Factors influencing regeneration .

SECTION D

APPLIED ZOOLOGY

Beneficial animals: Basic principles of practices in culturing of i) silkworms (Sericulture), ii) bees (Apiculture), iii) Aquaculture – fish, prawn and shell fish

Harmful animals: Pests -morphology, life cycle, damages caused and control measures of common insect pests of stored food grains and crops, nematode pests of crops, insect vectors (each two) ; Control – biological control and integrated pest management (IPM) .

References Books and Readings:

1. Developmental Biology by K.V.Sastry& Vinita Shukla – (Rastogi Publications, 2008).
2. Introduction to Embryology by B.I. Balinsky – (W.B. Saunders, Philadelphia,1976).
3. Foundations of Embryology by B.M Paten and B.M.Carison.
4. Foundations of Animal Development by A.F.Hopper and N.H.Hart (OxfordUniversity Press, New York, 1980).
5. Vertebrate Embryology by R.S.McEwen (Oxford & IBM Publishing CO.,New Delhi)
6. C.S.I.R. Wealth of India (Supplement) on Fish and Fisheries. (CSIR, NewDelhi).
7. Bee keeping by J.E.Eckert and F.R.Shaw.
8. Developmental Biology by J.W.Brookbank.
9. Patterns and Principles of Animal Development by J.W. Saunders. Jr.
10. Fish and Fisheries of India by V.G.Jhingran (Hindustan Publishing Corpn;New Delhi)
11. Economic Zoology by G.S. Shukla& V.B. Upadhyay.Elements of Entomology by Rajendra Singh.
12. Embryology by Barth IG (1966) – Holt Rinehart & Winston.
13. Development by Berril N & Karp G (1978) – Tata McGraw Hill Publ. Co.
14. Modern Embryology by Bodemer CW (1960) - Holt Rinehart & Winston.
15. Fundamentals of Comparative Embryology of Vertebrates by Huettner AF(1967) – 16. McMillan Co.
17. Chordate Embryology by Mohan Arora (1985) – Atma Ram & Sons.
18. Laboratory manual of Vertebrate Embryology by Rugh R – Allied Pacific Pvt.Ltd.
19. Chordate Embryology by Verma PS &Agarwal VK – Chand & Co.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	----	2	----	----	2	2	1	1	3	3	3
CO2	1	1	2	----	2	----	----	2	2	1	1	3	3	3
CO3	1	1	2	----	2	----	----	2	2	1	1	3	3	3
CO4		1	2	----	2	----	----	2	2	1	1	3	3	3
CO5	1	1	2	----	2	-	-	2	2	1	1	3	3	3
CO6	1	1	2	----	2	-	-	2	2	1	1	3	3	3

Course Title/Code	**Developmental Biology and Applied Zoology Lab (EDH311-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**0-0-2-0**
Credits	**1**
Course Objective	**To enable students to comprehend the modern concepts of developmental biology; to understand the developmental sequences in vertebrates; to compare the development of organs and systems; to identify the useful animals for harvesting the benefits and preventing the harmfulness with effective control measures.**

Course Outcomes (COs)		**Mapping**
CO1	**To study the different permanent slides of developmental stages of frog**	**Skill Development**
CO2	**To study the permanent slides of chick embryos**	**Skill Development**
CO3	**To Study the common insect pests of stored grains and crops, Study of common nematode pests of crops and Study of common insect vectors.**	**Employability/Entrepreneurship**
CO4	**To Study the economically important a) Fishes, b) crustaceans, c) molluscs**	**Employability /Skill Development**

Prerequisites (if any)	------

i) Study of different types of eggs (Insect, Frog, Hen).
ii) Study of permanent slides of different developmental stages in Frog a) Section of egg, b) early cleavage, c) blastula, d) morula, e) Gastrula
i) Study of permanent slides of a) neural plate, b) neural fold of Frog.
ii) Study of different developmental stages of Frog tadpole:
a) Early tadpole, b) hind limb stage, c) hind limb and fore limb stage, d) shorttailed stage, e) young Frog.
Preparation of window on hen's egg to study development of embryo.
Incubation of fertilized egg of chick, preparation of permanent mounting of embryo from incubated egg and identification of age of the embryo.
i)Study of permanent slides of chick embryos of
a) 13 hrs, b) 19 hrs, c) 24 hrs, d) 33 hrs, e) 48 hrs of incubation
Study of sections of chick embryos of
a) 19 hrs, b) 24 hrs, iii) 48 hrs of incubation
Rearing of two races of silkworm from egg to cocoon stages – conditions required, quality and quantity of food provided, precaution taken duringfeeding, moulting and spinning.
Harvesting cocoons, reeling of silk from the cocoons, study of some economic traits – fecundity, larval duration, cocoon weight, shell weight and silk weight. 9.a.Study of common insect pests of stored grains and crops b.Study of common nematode pests of crops.
c.Study of common insect vectors
10.Study of economically important
a) Fishes, b) crustaceans, c) molluscs Field Visit- Agricultural college or farm

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	-	-	3	1	2	-	-	-	3	--	3
CO2	1	1	2	-	-	-	2	-	2	--	-	3	-	3
CO3	1	-	2	--	-	1	2	-	2	-	-	3	-	-

CO4	1	1	2	--	-	1	2	--	-	3	-	3	-	-

Course Title/Code	**Atomic and Molecular Physics (PHH432-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**-To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to understand the basic knowledge of Atomic structure, and its interpretation based on different models.**	**Skill Development**
CO2	**Students would be able to learn about atomic spectra in presence of magnetic field and electric field. Students would be able to understand different quantum numbers and the selection rules, electronic configuration and L-S coupling.**	**Skill Development**
CO3	**Students would be able to understand about the molecule structure and associated spectra. Diatomic molecule and associated energy levels will be discussed.**	**Skill Development**
CO4	**Students would be able to understand the basic concept in electromagnetic theory & Maxwell equations.**	**Employability**

Prerequisites (if any)	

SECTION A

Atomic Spectra: Bohr atomic model & its inadequacy correction due to finite mass of the nucleus, Rydberg's constant in terms of reduced mass, Excitation and Ionization potentials, Franck-Hertz experiment, vector model of an atom, Electron spin, space quantization, magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment and its theory. [16 L]

SECTION B

Spin-orbit interaction and Fine structure of spectral lines. Quantum numbers and selection rules. Pauli's exclusion principle. Electronic configuration of atoms. Valence electron and a brief mention of L-S and J-J coupling.

Zeeman effect: Explanation of Zeeman effect on the basis of vector model of atom, Expression for Zeeman shift and experimental details. Anomalous Zeeman effect, A qualitative mention of Paschen – Back effect. [12 L]

SECTION C

Molecular Spectra

Molecular formation, the H_2 molecular ion, H_2 – molecule. Magnetic Moment of the Electron, Lande g-Factor, Pauli Exclusion Principle, Shell Structure. Hund's Rule, Spectroscopic Terms of Many Electron Atoms in the Ground State Diatomic Molecules– Rotational and Vibrational Energy Levels, Basic Ideas About Molecular Spectra, Raman Effect and Its Application to Molecular Spectroscopy (Qualitatively). [12L]

SECTION D

Electromagnetic Theory and Maxwell's Equations

Displacement current, Setting up of Maxwell's equations in SI units, Hertz experiment, Travelling electromagnetic wave, Wave equations (qualitative and quantitative) – Energy transport and Poynting vector, Poynting theorem. A radiation pressure (Normal and Oblique incidence). Concept of electric dipole, magnetic dipole, expression for energy radiated by a dipole (No derivation) [12 L]

References Books and Readings:

1. Introduction to Modern Physics, Mani and Mehta.
2. Perspectives of Modern Physics Beiser.
3. Electromagnetism, Reitz and Milford.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	3	2	2	1	1	1	1	1	2	3	3	1	1	1
CO2	3	2	2	1	1	1	1	1	2	3	3	1	1	1
CO3	3	2	2	1	1	1	1	1	2	3	3	1	1	1
CO4	3	1	1	2	1	2	3	1	2	2	3	1	1	1

Course Title/Code	Atomic and Molecular Physics Lab (PHH432-P)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	0-0-2-0	
Credits	1	
Course Objective	To develop the ability to set up apparatus, to collect and analyze the data to determine the desired physical quantity.	
Course Outcomes (COs)	Mapping	
CO1	Understand of the fundamental concepts used in Optics, and atomic molecular physics.	Skill Development
CO2	Analyze and design various conceptual based AMP experiments and verify the fundamental laws.	Skill Development
CO3	Identify basic requirements for a design application and propose a cost-effective solution.	Skill Development
CO4	Find a new cost-effective experiments in Atomic and molecular Physics	Employability
Prerequisites (if any)		

Experiments on

A. Biprism
B. Spectrometer
C. Series and Parallel Resonance
D. Current balance-magnetic induction
E. Coupled oscillations
F. Polarimeter
G. Interference – air wedge
H. Resolving power
I. Michelson interferometer

References

1. Practical Physics, E. Armitage, John Murray.

2. Advanced Practical Physics, Worsnop and Flint.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	3	-	-	3	-	3	3	-	-	3	-	-	-	-
CO2	3	-	-	3	-	3	3	-	-	3	-	-	-	-
CO3	3	-	-	3	-	3	3	-	-	3	-	-	-	-
CO4	3	-	-	3	-	3	3	-	-	3	-	-	-	-

Course Title/Code	**Pedagogy of Physical Sciences (EDH128-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-0-0-0**
Credits	**3**

Course Objective	**To focus on the various aspects of physical science like knowledge, understanding, nurturance of process skills, development of scientific attitude, scientific temper, nurturance of curiosity, creativity, and aesthetic sense, imbibing values, developing problem solving and relating physical science education with nature, social environment, technology, and society common at all educational processes.**	
Course Outcomes (COs)		**Mapping**
CO1	**To understand the epistemology of science as a school subject in the school curriculum.**	**Skill Development**
CO2	**To implement various pedagogical approaches to teaching of science at different stages of school.**	**Skill Development**
CO3	**To plan units and lessons through thematic approach in a holistic manner.**	**Employability**
CO4	**To critically examine teaching-learning processes that incorporate enquiry, discovery, activity-based learning, problem solving situations and investigatory projects etc. within the classroom.**	**Entrepreneurship**
CO5	**To integrate knowledge of science with other school subjects.**	**Entrepreneurship & Skill Development**
CO6	**To integrate knowledge of science in day-to-day life.**	**Employability**
Prerequisites (if any)	**Basic Knowledge of Physical Science**	

SECTION A

NATURE AND SCOPE OF SCIENCE

Definition of Science, Nature of Science. Concept, facts, theories, and generalizations. Contributions of Indian and International Physicists and Chemists (Isaac Newton, John Dalton, J.C. Bose, Albert Einstein, Niel Bohr, C.V. Raman to name a few) to the knowledge domain of Physical Science with special reference to the methods of discovery/ Investigation adopted.
Science as a process of constructing knowledge; Scientific methods: A critical view, how science works; role of science teacher. Integration and Application of knowledge of Physical Sciences with other school subjects and in daily life.

SECTION B

PLANNING, DESIGNING AND TRANSACTION

Aims and objectives of teaching physical science, Development of scientific attitude and temper, Development of Unit plan, Lesson Plan, Concept maps using a variety of approaches. Developing and writing Learning Objectives: Anderson and Krathwohl's Taxonomy. Teaching Learning Process with a focus on: Lecture cum demonstration method, Heuristic/ Inquiry approach, Problem solving approach, Project method, Constructivist approach, peer learning/ group learning, team teaching, Experiential learning, Cognitive conflict, Analogy strategy.
Appreciating every child's natural curiosity of observation and drawing conclusions, facilitating lifelong learning in students with special educational needs.
Science Laboratory: Organization and Management, Using Laboratory as a learning resource approaches to Laboratory work, safety in Laboratory, handling hurdles in utilization of resources.

SECTION C

PEDAGOGICAL SHIFT IN PHYSICAL SCIENCES

Each learner is Unique, Pedagogical shift from science as a fixed body of knowledge to the process of constructing Knowledge. Content cum methodology, Pedagogical Analysis (any three topics from physics and chemistry)
Need of Inclusion in all aspects of teaching-learning of Physical sciences-science curriculum, approaches, ICT and professional development of teachers. Improvisation of Apparatus, identifying some inexpensive sources of chemicals

SECTION D

ASSESSMENT OF LEARNING

Continuous and Comprehensive Evaluation (CCE): need and importance; Assessment and evaluation as intertwined process of classroom experience. Learning Indicators (LIs) and its types, developing LIs for activity, presentation, group work, assignments etc. Tools and

techniques of Assessment: assessment of written and oral work, project work, Laboratory work, field trips, journal writing, concept map; Assessment of learners with special needs.
Recording and reporting of learning evidence- measurement of achievement, process skills and aptitude of learners; Portfolio- its role in evaluating students' performances. Role of reflection in students' achievement.

Reference Books and Readings:

1. Alsop, S. and Hicks, K. (2007): *Teaching Science: A Handbook for Primary and Secondary school teachers,* Kogan Page, N. Delhi.
2. CBSE (2009). Teacher's manual on CCE. New Delhi: CBSE.
3. Chikara, M.S. and Sarma, S. (1985). Teaching Science. Ludhiana: Prakash Brothers.
4. Das, R.C. (1985). *Science teaching in Schools.* New Delhi: Sterling Publications Private Ltd.
5. Krathwohl, D.R., Bloom B.S. and Maria B.B. (1964) *Taxonomy of Educational Objectives, Handbook II, Affective Domain*, New York: David McKay.
6. Lindfors, J. (1984). *How do children learn or how teachers teach?* A Profound confusion: Language Arts, 61 (6), 600-606.
7. National Curriculum Framework 2005, NCERT, New Delhi.
8. Ramakrishna, A. (2012). *Methodology of Teaching Integrated Sciences.* New Delhi: Pearson.
9. Steffe, L. and Gale, J. (Eds.) 1995). *Constructivism in Education*, New Jersey: Lawrence Erlbaum Associates Inc.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	3	3	2	1	1	3	2	1	2	2	1	2

CO2	3	3	3	--	2	2	---	2	1	--	---	1	--	---
CO3	--	--	3	3	3	2	---	3	1	2	---	1	2	---
CO4	---	3	---	2	2	1	2	---	2	--	1	2	--	1
CO5	--	3	2	1	2	1	---	--	3	2	---	3	2	---
CO6	1	---	1	---	3	---	3	2	2	3	3	2	3	3

Course Title/Code	**Pedagogy of Physical Sciences (EDH128-P)**	
Course Type	**Core**	
Course NAture	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To focus on the practical aspects of learning the pedagogy of physical science such as preparing instructional objectives as per Bloom's Taxonomy, develop micro lesson plans for various micro teaching skills, prepare lesson plan for teaching physical science, preparing concept maps, and constructing a test for students' evaluation and assessment.**	
Course Outcomes (COs)		**Mapping**
CO1	**Understand the Bloom's Taxonomy of Instructional Objectives and design learning objectives for content related to Physical Sciences.**	**Skill Development**
CO2	**Understand the micro teaching skills and prepare the micro lesson plans for each skill.**	**Skill Development**
CO3	**Learn about the Herbartian lesson plan and prepare the lesson plans for teaching Physical Science.**	**Employability**
CO4	**Apply different pedagogical approaches to design lesson plans.**	**Entrepreneurship**

CO5	**Learn about the test construction and construct a test paper for students' assessment.**	**Entrepreneurship & Skill Development**
Prerequisites (if any)	**Basic knowledge of Physical Science**	

1. Designing Laboratory experiences for use in the teaching-learning process in classroom situations- two innovative activities and two improvised apparatus.
2. Prepare a First Aid box equipped with all the essential things in it.
3. Report of one Action Research carried out in the practicing school.
4. Report on measures being taken for inclusive teaching-learning in practicing schools.
5. Concept mapping in selected units in Physical Science Planning learning situations for constructing knowledge in Physical Science.
6. Group Discussion on pedagogical issues.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO	PSO3
CO1	2	2	3	2	2	2	3	3	2	3	3	2	1	2
CO2	3	3	3	2	3	3	3	3	2	3	3	1	--	---
CO3	3	2	2	2	3	3	3	3	2	2	2	1	2	---
CO4	2	2	3	2	2	2	2	3	2	3	2	2	--	1
CO5	2	2	3	2	2	2	2	3	1	3	1	3	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	2	3	3

Course Title/Code	**Reading and Reflecting on Texts (EDW101)**
Course Type	**Core**
Course Nature	**Workshop**
L-T-P-0 Structure	**0-0-3-0**
Credits	**1.5**
Course Objective	**Comprehend and think reflectively on spoken or written texts**

Course Outcomes (COs)	**Mapping**

CO1	**Explain the concept and importance of Reflection through reading especially in the context of the teaching profession.**	**Employability**
CO2	**Read and respond to a variety of texts in different ways as reader and writer.**	**Skill Development**
CO3	**Engage in Interactive groups discussions with respect to reading and reflection activities.**	**Skill Development**
CO4	**Explore different ways of developing reflective and critical thinking in personal and professional spaces.**	**Entrepreneurship**

SECTION A

Acquisition of reading skills, Reading as resource; Reading a wide variety of texts such as Descriptive, Narrative, Literary, Factual, Expository, Historical work, Policy documents, Ethnographies. Process of critical and reflective reading

SECTION B

Concept and distinguishing features of reflective writing, writing with a sense of purpose; Writing Skills for Teachers: writing letters, applications, reports, minutes, and essays; writing about research; writing annotations, references and bibliography; writing journals and reflective diaries, etc.

Reference Books and Readings:

1. Badheka, G. (2006). Divasvapan. National Book Trust. Retrieved from http://www.arvindguptatoys.com/
2. Bhatt, H. (n.d).The diary of a school teacher. An Azim Premji University Publication. Retrieved from www.arvindguptstoys.com/arvindgupta/diary-school-teacher-eng.pdf
3. Butler, A. and Turbill, J. (1984). Towards Reading-Writing Classroom. New York: Primary English Teaching Association Cornell University.
4. California Yule, G. (2006).The study of language. Delhi: Cambridge University Press.
5. Grellet, F. (1981). Developing reading skills: A practical guide to reading comprehensionexercises. Cambridge University Press.
6. Reading Development Cell, NCERT (2008).Reading for meaning. New Delhi: NCERT.
7. Watton, P., Collings, J. and Moon, J. (2001). Reflective Writing- Guidance notes for students. University of Exeter. Retrieved from www.exeter.ac.uk/fch/work-experience/reflective-writing-guidance.pdf
8. 32 Ways to Use Google Apps in the Classroom - Google Slides. Retrieved fromhttps://docs.google.com/presentation/d/1_6fh7wXkugHQbbA2ILrjsFqysvclJCbul2I3Oc912D8/present#slide=id.i0

1. Engaging with narrative and descriptive accounts in stories or chapters.
2. Re-telling the account (in one's own words) from different points of view after reading a specified content given by the teacher.
3. Writing based on text e.g. summary of any given text, extrapolation of a story, converting a situation into a dialogue etc.
4. Read a journal article, newspaper article or a chapter and write personal responses and summary.
5. Assessment of reading comprehension based on a given passage. The chosen text should befrom different genres like story, description, conversation, poem etc.
6. GROUP ACTIVITY-Take two reference books on any one topic of your choice and conduct a comparative study.
7. Prepare presentations on literary (Autobiography/ ethnographic) text.
8. Prepare a Vocabulary Book (50 words) with Meanings and Usage.
9. Make a report based on reflection & analysis of any one Educational Policy/Document like Kothari commission, NPE 1986, POA – 1992, RTE Act, NCF 2005 etc.
10. Make your students read and then write a reflective summary of a text given by you. After assessing their reflective abilities submit a brief account of the same.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	3	-	1	-	2	-	-	3	-	-	3
CO2	2	3	-	2	-	1	-	2	-	-	2	-	-	2

CO3	2	2	-	2	-	1	-	2	-	-	2	-	-	2
CO4	3	3	-	2	-	1	-	3	-	-	3	-	-	3

Course Title/Code	**Phase-II Field Engagement (EDO314)**
Course Type	**Core**
Course Nature	**Outcome**
L-T-P-0 Structure	**0-0-0-2**
Credits	**2**

Course Objective	**The purpose of the internship programme is to provide the students with the opportunity of undergoing a meaningful experience as practioner. Student is able to test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period**	
Course Outcomes (COs)		**Mapping**
CO1	**Recognise the contribution of psychological, philosophical and socio - economic factors in optimizing teaching and learning**	**Skill Development**
CO2	**Articulate experiences of observing the teaching of mentor teacher/ teachers and peers**	**Skill Development**
CO3	**Present the observations of internship period in a systematic and structured manner in the form of individual and/or Group Tasks**	**Skill Development**
CO4	**Provide constructive feedback to the peers and accept feedback from them with respect to their teaching**	**Skill Development**

CO5	**Appreciate importance of school engagement program as a integral component of teacher training programme**	**Skill Development**
CO 6	**Demonstrate an understanding of the differences between government and private school settings and ways of functioning.**	
Prerequisites (if any)	**NA**	

Mode - Simulated teaching by trainee teachers and peer observation

- Online Simulated Teaching by trainee teachers (one lesson each by one pupil teacher according to the pedagogy subject)
- Extensive Mentor and Peer Feedback from both institutions
- Daily engagement of six hours including presentation and observation of lessons ● ColLaborative learning and sharing of best practices of both institutions

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	3	-	-	-	-	3	3	3	3
CO2	3	-	-	-	-	3	-	-	-	-	3	3	3	3
CO3	3	-	-	-	-	3	-	-	-	-	3	3	3	3

CO4	3	3	-	-	-	3	3	-	-	-	3	-	-	3
CO5	3	3	-	-	-	3	-	-	-	-	3	-	3	3
CO6	3	3	-	3	-	-	-	-	-	-	3	-	3	3

SEMESTER - 7										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/ Workshop/ NTCC)**	**COURSE TYPE (Core/ Elective /University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
CHH 315T	Spectroscopy, Natural Products and Heterocyclics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
CHH 315-P	Spectroscopy, Natural Products and Heterocyclics Lab				0	0	2	0		
PHH 433T	Nuclear and Solid State Physics	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
PHH 433-P	Nuclear and Solid State Physics Lab				0	0	2	0		
EDH 410T	Biochemistry , Plant Tissue culture and Biotechnology	EDU			3	0	0	0	5	
EDH 410-P	Biochemistry , Plant Tissue culture and Biotechnology Lab				0	0	2	0		
MAH 455T	Numerical Analysis	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4

MAH 455-P	Numerical Analysis Lab				0	0	2	0		
EDH 411T	Genetics and Palentology	EDU			3	0	0	0	5	
EDH 411-P	Genetics and Palentology Lab				0	0	2	0		
MAH 453T	Linear Algebra	APPLIED SCIENCE	HARD	CORE	3	1	0	0	6	4
MAH 453-P	Linear Algebra Lab				0	0	2	0		
EDH 402T	Molecular Biology and Immunology	EDU			3	0	0	0		
EDH 402-P	Molecular Biology and Immunology Lab				0	0	2	0	5	
EDN 412	Seminar	EDU	NTCC	CORE	0	0	0	2	0	2
EDS2 36	School leadership and Management	EDU	SOFT	ELECTIVE	1	0	2	0	3	2
MO OC21OEDS-402	Educational Leadership									
EDS2 20	Peace and Value Education									
EDS2 21	Guidance and Counseling									
EDS2 22	Human Rights in Education									

EDS2 23	Environment and Education										
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				13	4 (PCM)/ 1 (ZBC)	10	2	27(PCM/ 24 (ZBC)	20	

Course Title/Code	Spectroscopy, Natural Products and Heterocycles (CHH315-T)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	3-1-0-0	
Credits	4	
Course Objective	To give an in-depth exposure of Natural Products and familiarize the students with basic concepts of Spectroscopic techniques	
Course Outcomes (COs)		Mapping
CO1	To develop an understanding of basic principles of Spectroscopy and be able to apply the principles in the structural elucidation of simple organic compounds	Employability
CO2	Learn the different types of alkaloids and terpenoids, their chemistry and medicinal importance and be able to apply knowledge of natural compounds as lead molecules for new drug discovery.	Skill Development
CO3	Describe the chemistry of biomolecules like carbohydrates, lipids, proteins and amino acids	Skill Development
CO4	Use fundamental polymer chemistry to explain and predict the synthesis of polymers as well as the resultant structure and properties.	Skill Development
CO5	To understand the chemistry of drugs with respect to their pharmacological activity. To understand the fundamentals of Dyes.	Skill Development
CO6	To understand the fundamental theoretical understanding of heterocyclic chemistry, including alternative general methods for ring synthesis and application of such methods for the preparation of specific groups of heterocyclic systems.	Skill Development
Prerequisites		

SECTION A

Drugs and Macromolecules

Drugs: Introduction, classification, structure and synthesis of sulpha drugs-sulphapyridine, sulphathiozole, sulphadiazine and sulphaguanidine, mechanism of action. Antimalarials – plasmaquin, mepacrine and chloroquin.

Macromolecules: Introduction, Classification, Types of polymerization–chain polymerization, step polymerization, free radical polymerization, co-polymerisation, Ionic polymerization, Coordination polymerization. Natural and synthetic rubbers – buna S, butyl rubber and neoprene. Synthetic fibres – nylon 6, nylon 6,6, terylene. Conducting polymers – polypropylenes and polyanilines.Bio-degradable polymers.

SECTION B

NATURAL PRODUCTS

Carbohydrates: Introduction, classification and nomenclature. Configuration of monosaccharides. Erythro and threo diastereomers. Interconversions in carbohydrates– glucose to fructose, fructose to glucose, aldopentose to aldohexose and aldohexose to aldopentose. Epimerisation, mechanism of osazone formation, Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Structural elucidation of D(+) glucose. Mechanism of Mutarotation. Constitution of disaccharides - maltose, sucrose and lactose. Introduction to polysaccharides (starch and cellulose) without involving structure determination.
Alkaloids : Introduction, general methods of structural determination, structural elucidation of Conine, Nicotine and piperine
Terpinoids: Introduction, isoprene rule, structural elucidation of Citral and Menthol **(10 L)**

Section C

Analytical Spectroscopy

UV and Visible spectroscopy: Introduction, absorption laws, instrumentation, formation of absorption bands, types of electronic transitions, chromophores, auxochromes, absorption and intensity shifts, solvent effects, Woodward – Fieser rules for calculating absorption maximum in dienes and α,β-unsaturated carbonyl compounds.
IR spectroscopy: Introduction, theory of molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, finger print region and applications of ir spectroscopy.

NMR spectroscopy: Introduction, instrumentation, number of signals, position of signals (Chemical shift), shielding and deshielding effects, factors influencing chemical shifts- inductive effect, anisotropic effect and hydrogen bonding. Splitting of signals, spin-spin coupling, chemical exchange and coupling constant.
Structural determination of simple organic compounds using uv, ir and nmr spectral data. **(10 L)**

SECTION D

DYES and amino acids

Dyes: Introduction, Classification of dyes, Colour and constitution (electronic concept), synthesis and uses of Methyl orange, Phenolphthalein, Fluorescein and Indigo.

Amino acids, Peptides, Proteins and Nucleic acids

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and - amino acids. Classification of proteins. Peptide structure determination - end group analysis, selective hydrolysis of peptides. Solid-phase peptide synthesis. Primary and secondary structures of proteins. Protein denaturation. reactions of □

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	3	3	3	-	-	-	-	2	1	-	2	1	-
CO2	-	3	3	3	-	-	-	-	2	1	-	2	1	-
CO3	-	3	3	3	-	-	-	-	2	1	-	2	1	-
CO4	-	3	3	3	-	-	-	-	2	1	-	2	1	-
CO5	-	3	3	3	-	-	-	-	2	1	-	2	1	-
CO6	-	3	3	3	-	-	-	-	2	1	-	2	1	-

Course Title/Code	Spectroscopy, Natural Products and Heterocycles (CHH315-P)	
Course Type	Core	
Course Nature	Hard	
L-T-P-0 Structure	0-0-2-0	
Credits	1	
Course Objective	To give an in-depth exposure of Natural products and familiarize the students with basic concepts of Spectroscopic techniques	
Course Outcomes (COs)		Mapping
CO1	Study and understand the working of instrumentation techniques like UV, FTIR and NMR	Skill Development
CO2	Hands-on-training on the synthesis and structure elucidation of natural products	Skill Development
CO3	Synthesis of drug and macromolecules	Skill Development
CO4	Experimental understanding of heterocyclic compounds with structure elucidation	Skill Development
Prerequisites		

Laboratory Synthesis

1. To synthesize Urea Formaldehyde Resin
2. To synthesize Phenol Formaldehyde
3. To Detect the presence of Carbohydrate- Glucose, Fructose, Sucrose
4. To Synthesize Osazone

Isolation and extraction of natural products.

1. Limonene from Orange peel
2. Nicotine from Tobacco
3. Lactose from Milk

Spectroscopic Experiments

1. To calculate the maximum wavelength of organic compounds using UV spectroscopy
2. To study the Effects of sample concentration Dependence of Absorbance (Beer Law)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	3	3	-	-	-	-	3	1	-	2	1	-
CO2	-	2	3	3	-	-	-	-	3	1	-	2	1	-
CO3	-	2	3	3	-	-	-	-	3	1	-	2	1	-
CO4	-	2	3	3	-	-	-	-	3	1	-	2	1	-

Course Title/Code	**Nuclear and Solid-State Physics (PHH433-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**3**	
Course Objective	**Students will be introduced to the basic knowledge of nuclear and solid-state physics for an understanding of physics of nuclei and of solids and will have the ability to determine the desired physical quantity.**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to describe the nuclear structure on the basis of different nuclear model.**	**Skill Development**
CO2	**Students would be able to describe radioactive elements and half-life of the elements and familiar with nuclear Reactors/ Detectors**	**Skill Development & Employability Development**
CO3	**Students would be able to explain and analyze the different crystal structures and different models for thermal properties of solids**	**Employability Development**
CO4	**Students would be able to determine the electrical, magnetic and superconducting properties of materials**	**Entrepreneurship & Skill Development**
Prerequisites (if any)	**Basic Knowledge of atomic and nuclear Physics**	

SECTION A ATOMIC NUCLEUS

Nuclear structure; Neutron, its discovery and properties; Basic properties of nucleus-charge, spin, radii, mass, magnetic moment; Nuclear forces and their characteristics; Yukawa's Theory (Qualitative); Packing fraction and Binding energy; Nuclear stability, Nuclear Models-Liquid drop model; Semi-empirical mass formula; Shell model and magic numbers (qualitative).

SECTION B RADIOACTIVITY AND PARTICLE PHYSICS

Radioactive decay: Half-life, mean life, Decay constant, Radioactive displacement laws, Theory of□ decay (qualitative); Geiger-Nuttal law; Beta decay, Beta spectra, Neutrino hypothesis, Gamma decay, pair production; successive disintegration, units of radio activity, radioactive dating, uncontrolled and controlled chain reactions; nuclear fission and fusion, Nuclear reactors, Quarks and gluons, GM counter.

SECTION C CRYSTAL STRUCTURE AND THERMAL PROPERTIES OF SOLIDS

Crystal Structure: Concepts of a lattice, unit cell and Bravais lattice, Fundamental lattice systems and their types, Miller indices, Coordination number, packing fraction for cubic crystals (sc, bcc and fcc),Various types of bonding, cohesive energy and compressibility of ionic crystals, Madelung constant, Thermal Properties: Specific heat of solids, Einstein and Debye theories.

SECTION D ELECTRICAL AND MAGNETIC PROPERTIES OF SOLIDS

Electrical Properties: Free electron model of a metal, Distinction between metals, semiconductors and insulators, Hall effect, Expression for Hall coefficients, Magnetic Properties: Langevin's theory of Dia and Para magnetism, Curie-Weiss Law, Qualitative description of Ferromagnetism, Superconductivity: Qualitative description, critical temperature and Meissner Effect, Applications of High temperature superconductors.

References Books and Readings:

(i) Perspectives of Modern Physics, Beiser
(ii) Nuclear Physics, Kaplan.
(iii) Nuclear Physics, Subramanyam and Brijlal.
(iv) Concepts of Nuclear Physics, Cohen.
(v) Solid State Physics, A J Dekker.
(vi) Introduction to Solid State Physics, C Kittel.
(vii) Modern Physics, Kiein

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	2	1	2	1	-	1	3	3	1	3	3	2

CO2	-	-	2	1	2	1	-	1	3	3	1	3	3	2
CO3	-	-	2	1	2	1	-	1	3	3	1	3	3	2
CO4	-	-	2	1	2	1	-	1	3	3	1	3	3	2

Course Title/Code	**Nuclear and Solid-State Physics Lab (PHH433-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To develop learners' self-assessment skills of nuclear reactions and solid-state properties on atomic and subatomic level and will have the ability to determine the desired physical quantity.**	
Course Outcomes (COs)		**Mapping**
CO1	**Students would be able to understand of the fundamental concepts and techniques used in Nuclear Physics.**	**Skill Development**
CO2	**Students would be able to examine the electronic charge and specific charge of electron, i.e., charge mass ratio**	**Skill & Employability Development**
CO3	**Students would be able to measure of energy band gap of semi-conductor materials and charge carrier concentrations**	**Skill & Employability Development**

CO4	**Students would be able to verify the value of various Physical constant like Rydberg constant, Planck constant, Hall coefficient etc.**	**Skill & Employability Development**
Prerequisites (if any)	**-----**	

1. Magnetic susceptibility
2. e/m of electrons
3. Rutherford model
4. G M tube
5. Millikan oil drop
6. Planck's constant
7. Energy gap of a semiconductor
8. Fermi energy
9. Rydberg constant
10. Hall effect

References Books:

1. Advanced Practical Physics- B. L. Worsnop and Flint.
2. Practical Physics- S. L. Gupta and V. Kumar
3. B. Sc. Practical Physics- Harnam Singh and P. S. Hemine 4. Advanced Practical Physics- Chauhan and Singh
5. Physics Laboratory Instructions, RIE, Mysore.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	-		3	3	3	-	3	-	-	3	-
CO2	3	3	-	-	-	3	3	3	-	3	-	-	3	-

CO3	3	3	-	-	-	3	3	3	-	3	-	-	3	-
CO4	3	3	-	-	-	3	3	3	-	3	-	-	3	-

Course Title/Code	**Biochemistry, Plant tissue culture and Biotechnology (EDH410-T)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**(3-0-0-0)**	
Credit	**3**	
Objectives	**After going through this course, the learner will be able to understand the structure and functions of biological macromolecules.**	
Course Outcomes (COs)		**Mapping**
CO1	**understand the structure and functions of biological macromolecules**	**Skill Development**

CO2	**get acquainted with the techniques, branches and applications of plant tissue culture**	**Skill Development**
CO3	**get acquainted with the tools and techniques of biotechnology, the processes involving gene manipulation and their applications**	**Skill Development/Employability**
Prerequisites (if any)	**----------**	

SECTION A

BIOCHEMISTRY

Carbohydrates: Introduction, classification, chemical structures of mono, oligo and polysaccharides, synthesis and breakdown of sucrose and starch.

Lipids: Introduction, classification, chemical structures, saturated and unsaturated fatty acids, synthesis and breakdown of fatty acids, □- oxidation.

Enzymology: Discovery, nature, nomenclature and classification, mechanism ofenzyme action, lock and key hypothesis, induce-fit hypothesis, regulation of enzyme action, inhibitors, prosthetic groups and coenzymes, factors affecting enzyme action

SECTION B

Plant Tissue Culture

a) Brief history, cellular totipotency, culture media and techniques

b) Brief account of anther/ pollen culture, endosperm, embryo and protoplast culture. c) Applications of tissue culture.

SECTION C BIOTECHNOLOGY

a) Tools and techniques, cloning vectors,

b) Brief account of genomics and c-DNA library,
c) Interferons, transposable elements

d) PCR, Bio-Informatics.

SECTION D

a.) Applications of Biotechnology – functional definition and applications.

b.) Brief account of DNA finger printing

c.) Agrobacterium – mediated gene transfer

d.) Achievements in crop improvement, transgenic plants.

References Books and Readings:

1. Lodish, H., Berk,A., Zipursky,S.L., Matsudaiva, P., Baltimoe, D. and Darnell, J. (2000). *Molecular Cell biology*. New York: W.H. Freeman & Co.
2. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., and Watson, I.O. (1999).*Molecular Biology of Cell*. New York: Garland Publishing Co., Inc.
3. Malacinski, G.M., (2005).*Essentials of Microbiology (4th Ed.)*. New Delhi: Narosa Publishing House.

4. Lea, P.J. and Leegood,R.C.(1999). *Plant Biochemistry and Molecular Biology*. England: John Wiley & Sons.
5. Srivastava, H.S. (2005).*Plant Physiology, Biochemistry and Biotechnology*. Meerut: Rastogi Publications.
6. Jain.J.L. (1994). Fundamentals of Biochemistry, New Delhi: Vikas Publishing House.
7. Old, R.W. and Primrose, S.B. (1989). *Principles of Gene Manipulation*. Oxford: Blackwell Scientific Publication

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	----	2	----	----	----	----	3	3	1	1	3	1	1
CO2	1	----	2	----	----	----	----	3	3	2	2	3	2	2
CO3	1	----	2	----	----	----	----	3	3	2	2	3	2	2

Course Title/Code	**Biochemistry, Plant tissue culture and Biotechnology Lab (EDH410-P)**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**(0-0-2-0)**	
Credits	**1**	
Objectives	**To familiarize with techniques in biochemistry and biotechnology.**	
Course Outcomes (COs)		**Mapping**
CO1	**To understand the molecular mechanisms operating in cells.**	**Skill Development**
CO2	**To familiarize with techniques in biochemistry and biotechnology.**	**Employability**
CO3	**To develop in the students the understanding of biochemical pathways inside an organism**	**Skill development**
CO4	**To demonstrate effect of environmental factors such as pH and temperature on various biomolecules.**	**Employability /Skill Development**
Prerequisites (if any)	**------**	

1. To test for the presence of carbohydrates, proteins and lipids

2.Isolation of DNA from coconut endosperm.
3.Effect of pH and temperature on activity of amylase in germinating seeds.

4.Effect of pH and temperature on activity of catalase and peroxidase.

5.Separation of amino acids by paper chromatography.

6.Study of root nodules in leguminous plants.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	3	-	-	-	-	2	3	1	1	3	--	3
CO2	1	1	2	-	-	-	-	2	2	1	1	3	-	3
CO3	1	1	2	--	-	-	-	2	2	1	1	3	-	3
CO4	1	2	3	-	-	-	-	2	2	1	1	3	-	3

Course Title/Code	**Numerical Analysis (MAH 455-T)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**3-1-0-0**

Credits	3	
Course Objective	**Students would be able to understand and apply the concepts of complex analysis and numerical techniques for solving the mathematical problems and their applications.**	
Course Outcomes (COs)		**Mapping**
CO1	**Demonstrate understanding of the basic concepts underlying complex analysis.**	**Skill Development**
CO2	**Apply the methods of complex analysis to evaluate definite integrals and infinite series.**	**Skill Development**
CO3	**Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, and the solution of nonlinear equations.**	**Skill Development**
CO4	**Apply numerical methods in Real Life problems.**	**Skill Development**
CO5	**Solve & analyze the Mathematical problems related to Numerical Analysis and its applications using software.**	**Skill Development**
Prerequisites (if any)		

Section A

Numerical Methods: Numerical Solutions of Algebraic and Transcendental equations, Bisection Method, Method of false position, Newton-Raphson method. Finite differences, Forward and Backward differences, Interpolation, Newton-Gregory forward and backward interpolation formula, Divided differences, Lagrange's interpolation formula.

Section B

Numerical Differentiation: Finding first and second derivatives using interpolation formulae, Integration: General quadrature formula, Newton-Cotes quadrature formula, Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Gauss quadrature.

Section C

Functions of a Complex Variable: Limits, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions. Conformal Mappings: Elementary Transformations, Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations.

Section D

Complex Integration: Introduction, Definite Integral, Cauchy's Theorem, Cauchy's integral Formula. Higher Derivatives. Power Series: Introduction, Sequences and Series, Sequences and Series of Functions, Power Series, Elementary Functions. (Remove) Add: - Taylor and Laurent Series, singularities and their types, Residue Theorem Application of residue theorem.

References:

1. Theory of Functions of a Complex Variable by Shanti Narayan, S. Chand and Co. Ltd.
2. Foundations of Complex Analysis by Ponnuswamy, Narosa Publishing House.
3. Complex Variables and Applications by Churchill, Brown and Verhey, McGraw Hill International Book Company.
4. Functions of One Complex Variable by Conway, Narosa Publishing House.
5. Complex Variables, Murray R. Spiegel, Schaum Outline Series, McGraw Hill Book Company.
6. Complex Analysis by Armugam, Tangapandi, Somasundaram, Scitech Publications Pvt. Ltd.
7. Numerical Analysis by Gupta, S. Chand and Co. Ltd.
8. Finite Difference and Numerical Analysis by Saxena, S.Chand and Co. Ltd.
9. Introductory Methods of Numerical Analysis by Shastry, PHI.
10. Numerical Methods for Scientists and Engineers, Grewal, Wiley Eastern Ltd.
11. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
12. Numerical Calculus by William Edmund Milne, Princeton University Press.
13. Introduction to Numerical Analysis by Hildebrand, Tata McGraw Hill Publishing Ltd.
14. Numerical Analysis by Schield, Schaum's Outline Series.

15. Introduction to Numerical Methods by Peter A. Stark, MacMillan Co. Ltd.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	--------	--	2	3	--	--	--	2	3	--	1	1	3	1
CO2	2	--	2	3	--	--	--	2	3	--	1	3	3	1
CO3	--	--	3	2	--	--	--	2	3	--	1	2	2	1
CO4	--	--	3	3	--	--	--	2	3	--	1	3	2	1
CO5	1	--	2	3	--	--	--	2	3	--	1	2	3	1

Course Title/Code	**Numerical Analysis Lab (MAH 455-P)**
Course Type	**Core**
Course Nature	**Hard**

L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**Students would be able to develop the skills for solving the mathematical problems and their applications.**	
Course Outcomes (COs)		**Mapping**
CO1	**Apply the methods of complex analysis to evaluate definite integrals and infinite series.**	**Skill Development**

List of Programmes

1. Introduction to Conditional statements –if and else using Octave 2.

Introduction to iteration-based programming – for loop using Octave

3. To find roots of an equation using Bisection method.
4. To find roots of an equation using Regula Falsi method.
5. To find roots of an equation using Newton Raphson method.
6. To find the value of a dependent variable for a given value of an independent variable using Lagrange's interpolation method for a given set of data.
7. To find the value of a dependent variable for a given value of an independent variable using
8. Newton divided difference interpolation for a given set of data.
9. To find the value of a definite integral using Trapezoidal rule of integration.
10. To find the value of a definite integral using Simpson's 1/3 rule of integration.
11. To find the value of a definite integral using Simpson's 3/8 rule of integration.
12. To find the solution of an ordinary differential equation of first order by Euler's modified method.

13. To find the solution of an ordinary differential equation of first order by R-K method.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	----	--	--	--	--	--	--	3	--	--

Course Title/Code	**Genetics and Paleontology EDH411-T**	
Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**To enable students to comprehend the modern concepts of genetics.**	
Course Outcomes (COs)		**Mapping**
CO1	**To understand the genetic composition of drosophila, Human population and learn method of genetic mapping**	**Skill Development**
CO2	**To understand the diversity of human genetic diseases.**	**Employability**
CO3	**To learn transgenic animal techniques**	**Skill Development**
CO4	**To develop the understanding of molecular bases of various genetic diseases.**	**Skill Development**
CO5	**To develop the understanding of Palaeontology**	**Employability**

CO6	**To understand Zoogeography**	**Skill Development**
Prerequisites (if any)	**NA**	

SECTION A

General Genetics

Sex determination – Chromosomal basis of sex determinations (XX–XO, XX–XY, ZZ– ZW types); multiple sex chromosomes; Genic balance theory;Gynandromorphs and sex mosaic; Sex determining genes; Barr body .

Linkage and crossing over: Linkage and crossing over in Drosophila;Cytological evidences for crossing over; Linkage maps.

Karyotype, banding, nomenclature of chromosome subdivisions and genetic map. Study of Human and Phlox/ Allium Karyotype (normal and abnormal)

SECTION B

Human Genetics: Pedigree of Mendelian human traits ; Eugenics, Euthenics,Euphenics; Inborn error of metabolism – Phenylketoneuria, Galactosemia;

Genetic disorders, Chromosomal aneuploidy (Down, Turner and Klinefelter syndromes), Chromosome translocation (chronic myeloid leukemia) and deletion (“cry of cat” syndrome), Gene mutation (cystic fibrosis)

Genetic screening and counselling; Introduction to applications of genetic engineering, Molecular diagnosis of genetic disorders and gene therapy, Crop and livestock improvement

SECTION C

Transgenic Animal Technology Production of transgenic animals-nuclear transplantation, Retroviral method, DNA microinjection method, Applications of transgenic mice, sheep, goat, pig, birds and fish, Dolly and Polly, Scientific significance, Therapeutic applications, Human cloning, Ethical issues of transgenic animals.

Molecular diagnosis of genetic diseases (Cystic fibrosis, Huntington's disease, Sickle cell anemia), RFLP, RAPD and DNA fingerprinting, Vaccines and therapeutic agents, Recombinant DNA in medicines (recombinant insulin and human growth hormone), Gene therapy, Enzymes in detergents and leather industries, Heterologous protein production, Bioremediation.

SECTION D

PALEONTOLOGY AND ZOOGEOGRAPHY

Geological time and its significance in evolution

Fossils – Fossils and fossilization; Living Fossils – Latemaria and Sphenodon the emergence and disappearance of invertebrates and vertebrates (Trilobites,Fishes and Reptiles) ; Paleontological history of man ,Zoogeography, with emphasis to oriental region and fauna

References Books and Readings:

1. Genetics by Stricksberger – (MacMillan).
2. Principles of Genetics by Sinnott, Dunn and Dobzhansky – (McGraw Hill).
3. Genetics by E. Altenberg – (Holt, Rinehart & Winston, New York).
4. Principles of Genetics by Gardner – (John Willey).
5. Principles of Genetics by Irwin H. Herskowitz – (Little Brown &Co.,Boston).
6. Elementary Genetics by Singleton WR – (Van Nostrand).
7. Basic Human Genetics by Elain J. Mange & Arthur P. Mange – (RastogiPublications, 2008).
8. Cytogenetics by P.K. Gupta – (Rastogi Publications, 2008)
9. Evolutionary Biology by B.S. Tomar& S.P. Singh – (Rastogi Publications,2008).
10. The origin of life by K.John – (Reinhold Publishing Corpn).
11. The evolution of Man by G.W.Lasker – (Holt, Rinehart & Winston).
12. Organic Evolution by R.S.Lull – (MacMillan).
13. Evolution by J.M.Savage (Holt, Rinehart and Winston)
14. Genetics and Evolution by RL Kochhar (S.Nagin& Co, New Delhi 1970)
15. Evolution in Action by J.Huxley (New American Library, New S.Nagin& Co,New Delhi 1970).

16. The Origin of Species by D.I.Charles (Collier Book, New York, 1966).
17. Evolution by Ayala F.G, Stebbins G.L & Valentine J. (1965) – SinauerAssociates.
18. Animal Evolution by Carter GS (1960) – Sedgenick& Johnson Ltd.
19. Zoogeography by Hubbs CL (1962) – AAAAS Washington
20. Evolution & Genetics by Morrel DJ (1962) – Holt Rinehart and Winston.
21. Vertebrate Paleontology by Romer AS (1966) – University Chicago Press.
22. The Process of Organic Evolution by Stebbins GL (1970) – Prentice HallPublication.
23. Genetics by Winchester AM (1966) – Oxford & IBH Publishing CO.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO2	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO3	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO4	2	1	2	--	3	----	--	2	1	1	1	3	3	3
CO5	2	1	2	---	3	----	--	2	1	1	1	3	3	3
CO6	2	1	2	---	3	----	--	2	1	1	1	3	3	3

Course Title/Code	**Genetics and Paleontology Lab EDH411-P**
Course Type	**Core**

Course Nature	**Hard**	
L-T-P-0 Structure	**0-0-2-0**	
Credits	**1**	
Course Objective	**To enable the students to identify and study drosophila and various fossils**	
Course Outcomes (COs)		**Mapping**
CO1	**To identify and study drosophila**	**Skill Development**
CO2	**To identify blood groups and Rh factor in man**	**Employability**
CO3	**To study various fossils models and living fossils**	**Employability**

1. Fruit flies – Collection, handling, rearing and maintenance of culture. Identification of sexes of Drosophila. Study of the life cycle of Drosophila.
2. Sorting out and study of mutant flies of Drosophila with reference to their various contrasting characters in comparison with normal flies-vestigial wings, ebonybody, curled wing, sepia eye, white eye and bar eye.
3. Study of Barr body in human buccal epithelial cells.
4. Identification of blood groups (ABO) and Rh factor in man.
5. Study of various types of beaks of local birds.
6. Study of five animals for mimicry.
7. Study of fossil models of Trilobites and fishes.

8. Study of teeth and skulls of horse, elephant and man.
9. Study of vestigial organs, models of dinosaurs, living fossils.

Field visit to Natural Science Centre, Delhi.

References Books and Readings:

1. Genetics by Stricksberger – (MacMillan).
2. Principles of Genetics by Sinnott, Dunn and Dobzhansky – (McGraw Hill).
3. Genetics by E. Altenberg – (Holt, Rinehart & Winston, New York).
4. Principles of Genetics by Gardner – (John Willey).
5. Principles of Genetics by Irwin H. Herskowitz – (Little Brown &Co.,Boston).

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO2	2	1	2	----	3	----	----	2	1	1	1	3	3	3
CO3	2	1	2	----	3	----	----	2	1	1	1	3	3	3

Course Title/Code	**Linear Algebra (MAH453-T)**
Course Type	**Core**

Course Nature	**Hard**	
L-T-P-0 Structure	**3-1-0-0**	
Credits	**4**	
Course Objective	**The students would be able to apply the concepts of Vector Space, Linear Transformation and inner product Space required for solving the mathematical problems and their applications.**	
Course Outcomes (COs)		**Mapping**
CO1	**Apply the concepts of vector spaces, subspaces, bases, dimension and their properties in related mathematical problems and spaces.**	**Skill Development**
CO2	**Find Relationship between matrices and linear transformations apply the same in real world problems.**	**Skill Development**
CO3	**Understand and apply the properties of inner product spaces and orthogonality in inner product spaces in related mathematical problems and spaces.**	**Skill Development**
CO4	**Recognize importance of adjoint of a linear transformation and its canonical form.**	**Skill Development**
Prerequisites (if any)	**Basic knowledge of sets and Matrices.**	

SECTION A

Vector Spaces – I

Vector spaces, Subspaces, Linear Combinations, Linear span, Linear dependence and Linear independence of vectors, Basis and Dimension, Finite dimensional vector space – some properties.

SECTION B

Vector Spaces - II

Quotient spaces, Homomorphisms of vector spaces, Isomorphism of vector spaces, Direct sums, Inner product spaces, Euclidean vector spaces, Distance, Length, Properties, Orthogonal vectors, Gram Schmidt Orthogonalisation Process, Orthogonal complement.

SECTION C

Linear Transforms – I

Linear maps as matrices, Change of basis and the effect of associated matrices, Kernel and Image of a linear transformation, Rank and Nullity theorems.

SECTION D

Linear Transforms - II

Singular and non-singular linear transformations, Elementary matrices and transformations, Similarity, Eigen values and Eigen vectors, Diagonalisation and Eigen vectors, Characteristic polynomial, Cayley, Hamilton Theorem, Minimal Polynomial.

References :

Theory and Problems of Linear Algebra, SaymourLipschitz, Schaum Outline Series.

Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.

Modern Algebra, Vol.II, by Narayanan and ManicavachagamPillay, S. Vishwanathan and Co.

Brief Survey of Modern Algebra, Brikhoff and Maclane, IBH

Linear Algebra by Sergr Lang, Addison Wesley Publishing company Inc. Vector Algebra, Shantinarayan and P K Mittal, S Chand and Co. Ltd.

Linear Algebra by Larry Smith, SpingerVerlag.

Elementary Linear Algebra with Applications, Keith Nicholson, PWS – Kent Publishing Company

Linear Algebra, SurjithSinth, Vikas Publishing House Pvt. Ltd. Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	2	--	--	3	1	2	--	1	2	--	--
CO2	2	3	1	2	--	--	3	1	2	--	1	2	--	--
CO3	2	3	1	2	--	--	3	1	2	--	1	2	--	--
CO4	2	3	1	2	--	--	3	1	2	--	1	2	--	--
CO5	2	3	1	2	--	--	3	1	2	--	1	2	--	--
CO6	--	--	--	--	--	3	--	--	--	--	--	--	--	--

Course Title/Code	**LINEAR ALGEBRA (MAH 453-P)**
Course Type	**Core**
L-T-P Structure	**0-0-2-0**
Credits	**1**

Course Objective	To develop in the students the practical knowledge of linear algebra	
Course Outcomes (COs)		**Mapping**
CO1	**To familiarise students with practical concepts of vector spaces, subspaces and linear dependence and independence of vectors**	**Skill Development**
CO2	**To make students understand the practical aspects of quotient spaces, homomorphism of vector spaces**	**Skill Development**
CO3	**To make the students understand the practical of Linear maps as matrices, rank and nullity theorems**	**Employment**
CO4	**To familiarise students with Elementary matrices and transformations, Similarity, Eigen values and Eigen vectors**	**Entrepreneurship**

LINEAR ALGEBRA LAB LAB EXERCISE

1. To construct vectors and find their dimensions.
2. To perform mathematical operations on vectors.
3. To graph various vectors and their linear combinations in and .
4. To graph various vectors and their linear combinations in the complex plane.
5. To generate various special type of vectors with real, complex or symbolic entries.
6. To generate matrices of various forms and construct their sub matrices.
7. To find Eigen values of a matrix.
8. To perform mathematical operations on Matrices.
9. To perform elementary row and column operations on a matrix.

10. To observe various visual forms of a matrix in and .
11. To obtain Inner product, orthogonal vectors and the matrices. To find angle between the vectors.
12. To find vector projection of a vector space and finding an orthonormal set of vectors in the Gram-Schmidt orthonormalization process.
13. To generate a non-homogeneous system of linear equations and constructing a corresponding augmented matrix.
14. To find exact and parameterized solution of a non-homogeneous system of linear equations.
15. To solve the linear system of equations over the field using the function *linearsolve* and verify the solution.

References:
Linear Algebra, SurjithSinth, Vikas Publishing House Pvt. Ltd. Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.

CO	PO1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO 9	PO10	PO 11
CO1	2	2	3	2	2	2	3	3	2	3	3
CO2	3	3	3	2	3	3	3	3	2	3	3
CO3	3	2	2	2	3	3	3	3	2	2	2
CO4	2	2	3	2	2	2	2	3	2	3	2

Course Title/Code	**Molecular Biology and Immunology EDH402-T**

Course Type	**Core**	
Course Nature	**Hard**	
L-T-P-0 Structure	**3-0-0-0**	
Credits	**3**	
Course Objective	**To enable students to comprehend the modern concepts and applied aspects of molecular biology and immunology.**	
Course Outcomes (COs)		**Mapping**
CO1	**To Understand the development, organization and functions of genes**	**Skill Development**
CO2	**To develop understanding of transcription and translation**	**Skill Development**
CO3	**To develop an understanding of techniques of immunology**	**Employability**
CO4	**To develop the skills required for designing the immune techniques**	**Entrepreneurship**
CO5	**To analyze and apply third generation vaccine**	**Entrepreneurship & Skill Development**
CO6	**To analyze and apply skills and tools to design the drugs against cancer**	**Entrepreneurship & Skill Development**

Prerequisites (if any)	**----------**

SECTION A

a) Genome Structure, Chromatin and the Nucleosome
Genome Sequence and Chromosome Diversity, Chromosome Duplication and Segregation, The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin. Regulation of Chromatin Structure and Nucleosome Assembly.
b)The Replication of DNA (Prokaryotes and Eukaryotes) Chemistry of DNA synthesis, general principles - bidirectional replication, Semi- conservative, Semi discontinuous, RNA priming, Various models of DNA replication including rolling circle, D-loop (mitochondrial), Θ (theta) mode of replication, Enzyme involved in DNA replication – DNA polymerases, DNA ligase, Primase, Telomerase and other accessory proteins

SECTION B

Mechanism of Transcription- RNA Polymerase and the transcription unit Transcription in Prokaryotes Transcription in Eukaryotes Unit 2. RNA Modifications, Split genes, concept of introns and exons, removal of Introns, spliceosome machinery, splicing pathways, alternative splicing, exon shuffling, RNA editing, and mRNA transport.

Transcription Regulation in Prokaryotes (Ch 16 Watson) Principles of transcriptional regulation, regulation at initiation with examples from lac and trp operons , Gene Silencing
Translation (Prokaryotes and Eukaryotes) Assembly line of polypeptide synthesis - ribosome structure and assembly, various steps in protein synthesis. Charging of tRNA, aminoacyl tRNA synthetases. Proteins involved in initiation, elongation and termination of polypeptides. Regulation of translation.

SECTION C

Components of immune system

a) Innate, Adaptive (cell mediated and humoral) - Immunity. Cells and Organs of the Immune System, Primary and Secondary lymphoid organs, Lymphatic system.
b) Antigens- Antigenicity and immunogenicity, Immunogens, Adjuvants and Haptens, Factors influencing immunogenicity,B and T-cell epitopes.

c) Immunoglobulins- Structure and Functions, Basic structure, deducing antibody structure, classes and function, Antigenic determinants on immunoglobulins, Antigen-antibody interactions, Polyclonal sera, Monoclonal antibodies,

SECTION D

a) Major Histocompatibility Complex- Structure, polymorphism and functions, MHC and immune responsiveness. Cytokines: properties and functions, Complement system: components, activation and functions.

b) Hypersensitivity, Immune System in Health & Disease, Vaccines: bacterial, viral, toxoid and generation vaccines, Immunodeficiency, Autoimmunity.

c) Cytology of Cancer – Characteristics of cancer cell, hypothesis about cancer;somatic mutation, viral mutation; types and causes of cancer, treatment .

References Books and Readings:

1. Cell and Developmental Biology by Sastry, Singh &Tomar – (RastogiPublications, 2008).
2. Cell and Molocular Biology by P.K. Gupta – (Rastogi Publications, 2008).
3. Cell Biology by C.B.Powar – (Himalya Publishing House, Bombay).
4. Cell Biology by De Robertiset.al – (W.B. Saunders, Philadelphia).
5. A Textbook of Cytology by R.C.Dalela&S.R.Verma – (Jaiprashnath& Co.,Meerut).
6. Cell Biology by J.D. Burke – (Scientific Book Agency, Calcutta).
7. Cell Biology: A molecular approach by R.D. Dyson – (Allyn& Bacon,Boston).
8. Cell Biology by R.M.Dowben – (Harper & Row, New York).
9. Cell function by L.L.Langley – (Affiliated East West Press, New Delhi).
10. Cytology by C.D. Darlington.
11. Immunology by S.S. Lal&Sanjeev Kumar – (Rastogi Publications, 2008).
12. Immunology by Janis Kuby.
13. Genes (Vol. I – VII) by Levin B. – CBS Publishers.
14. Cell and Molecular Biology by De Robertis EDP & De Robertis EMI. Jr(1996) – Holt WB

Saunders International.
15. Essentials of Molecular Biology by Feirfelder I (1997) – Narosa Publ. NewDelhi.
16. Cytology, Genetics & Evolution by Gupta PK (1992) – Rastogi Publications.
17. Molecular Cell Biology by Harvey L, Baltimore D, Berk A. et al., (1999) –Scientific American Source Book.
18. Principles of Biochemistry by Lehninger AL, Nelson DL & MM Cor (1993) –Kalyani Publishers, New Delhi.
19. Cytology &Cytogenetics by Swanson CP (1972) – MacMillan Co.
20. Animal Cytology and Evolution by MJD White – Cambridge University Press.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	----	2	----	----	----	----	1	2	1	1	3	1	1
CO2	1	----	2	----	----	----	----	1	2	1	1	3	3	3
CO3	1	----	2	----	----	----	----	1	2	1	1	3	3	3
CO4	1	----	2	----	2	----	----	1	2	1	1	3	3	3
CO5	1	1	2	----	2	----	----	1	2	1	1	3	3	3
CO6	1	1	2	----	2	----	----	1	2	1	1	3	3	3

Course Title/Code	**Molecular biology and Immunology Lab (EDH402-P)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-0 Structure	**0-0-2-0**
Credits	**1**

Course Objective	To enable students to comprehend the modern concepts and applied aspects of molecular biology and immunology.	
Course Outcomes (COs)		**Mapping**
CO1	**To study the staining of Mitochondria**	**Skill Development**
CO2	**Study of slides of grasshopper**	**Skill Development**
CO3	**Study of Karyotype of man**	**Employability**
CO4	**Study of antigen antibody reaction**	**Entrepreneurship**
Prerequisites (if any)	**-----**	

a) Staining of mitochondria in the buccal epithelial cells of man and ovary ofearthworm using vital stain. b) Study of mitosis in onion root tips.

c) Micrometry: Use of ocular and stage micrometers to measure cell and nucleardimensions of human buccal epithelial cells.

d) Study of slides of grasshopper (Poecilocerapicta) testis for the various stagesof meiosis.

e) Study of salivary gland chromosomes of Drosophila for banding patterns.

f) Study of salivary gland chromosomes of chironomous larva.

g) Study of Karyotype and idiogram of man.

h) Isolation of DNA from kidney/spleen of rat (demonstration).

i) Demonstration of antigen-antibody reaction in gels.

j) Cytological characterization of DNA by Feulgen staining (demonstration)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	1	----	2	----	1	2	1	1	3	1	3

CO2	1	1	2	1--	----	----	----	1	2	1	1	3	1	3
CO3	1	1	2	----	----	----	----	1	2	1	1	3	1	3
CO4	1	1	2	----	2	----	----	1	2	1	1	3	1	3

Course Title/Code	**SEMINAR (EDN412)**	
Course Type	**Core**	
Course Nature	**NTCC**	
L-T-P-O Structure	**(0-0-0-2)**	
Credits	**2**	
Course Objective	**Give the student the ability to analyse problems, create a hypothesis, assess and validate outcomes, and make logical conclusions from those results.**	
CO1	**To enable interest in a theme and structure thoughts for a presentation.**	**Entrepreneurship**
CO2	**To understand annotated bibliography with an outline that demonstrates scholastic abilities**	**Skill Development**
CO3	**To develop analysis and understanding of conceptual data.**	**Skill Development**
CO4	**To develop soft skills and employ cutting-edge technology to create proposal reports, such as Trello, Zotero, Jasper ai, and Ref-n-write**	**Skill-Development**

SECTION A

Introduction to the research process

Survey of the subject area of research. Search and selection of a personal area of interest.
Review of sources in the subject area of research. Presentation of the results of the analytical review in the selected area of interest. Collective discussion of the research topic.

SECTION B

Development of a research plan.

Discussion of the main idea for the practical implementation of the research results. Collective brainstorming to shape the proposed scientific novelty of the research. Review of presentation of the results of the primary/secondary data search.

SECTION C

Thesis Report Preparation

Preparation of the theses of the report and overview presentation of the project. Development and filling of the projects

SECTION D

Research project/proposal Development

Development of a research plan, formation of a list of the main sources used, and design of the first section of the research project. Preparation of an article based on the results of the work. Project presentation for collective discussion.

Reference Books:

- The Craft of Research, Third Edition, by Wayne C. Booth, Gregory G. Colombo, Joseph M. Williams , 2016
- The Research Methods Knowledge Base, 3rd Edition, By William M.K. Trochim and James P. Donnelly, 2008

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	----	1	3	3	3	1	3	3	3
CO2	----	---	2	---	---	----	1	3	3	3	----	3	3	3
CO3	1	1	2	1	1	----	1	3	3	3	1	3	3	3
CO4	----	---	2	---	---	----	1	3	3	3	----	3	3	3

Course Title/Code	**School Leadership and Management (EDS 236)**	
Course Type	**Elective**	
Course Nature	**Soft**	
L-T-P-0 Structure	**1-0-2-0**	
Credits	**2**	
Course Objective	**To enable students to understand key leadership theories and ideas and develop their own leadership and able to undertake practice-based tasks enabling self-evaluation of their leadership in action.**	
Course Outcomes (COs)		**Mapping**
CO1	**understand key leadership theories and ideas, from inside and outside education, and apply these to thinking about their own practice**	**Employability Development**
CO2	**draw on evidence from research and practice to develop knowledge with an understanding of what is known about effective leadership**	**Employability & Entrepreneurship Development**
CO3	**relate these to their own leadership context in planning actions**	**Skill Development**
CO4	**undertake practice-based tasks enabling self-evaluation of their leadership in action.**	**Skill Development &Employability Development**
CO5	**develop their reflective practice skills to help them to evaluate and improve their own leadership practice**	**Entrepreneurship & Skill Development**

CO6	**learn colLaboratively, supported by a mentor, to share insights, and develop knowledge and skills.**	**Skill Development &Employability Development**
Prerequisites (if any)		

Section A

Leadership: Concept and Dynamics

- Concept and functions of Leadership and management
- Theories of leadership (Trait Theory, Behavioural Theory, Situational Theory), Theories of Management (Taylor, Fayol, Max Weber) and its application in Educational organizations
- Models of educational leadership (Educational Leadership Model, Instructional Leadership Model)

Section B

Leadership Styles

- Authoritative Leadership v/s Participatory Leadership
- Transactional Leadership v/s Transformational Leadership
- Contemporary Leadership Styles: Situational leadership, Visionary Leadership, Ethical Leadership, Gender Leadership

Section C

Human Resource Management

- Concept of Human Resource Management, Process of Recruitment and Selection
- Types and Methods of Training
- Appraisal System and Grievance Handling

Section D

Team Building and Conflict management

- Concept of Group dynamics, types of groups, stages of group formation

- Conflict management: Concept and Strategies
- Stress management: Concept and Strategies

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	-	2	-	-	3	--	3	-	-	3	**3**	-	**3**
CO2	2	-	-	-	-	3	--	3	-	-	3	**3**	-	**3**
CO3	3	-	-	-	-	3	--	3	-	-	3	**3**	-	**3**
CO4	3	-	3	-	-	3	--	3	-	-	3	**3**	-	**3**
CO5	3	-	3	-	-	3	--	3	2	-	3	**3**	-	**3**
CO6	3	-	3	-	-	3	--	3	-	-	3	**3**	-	**3**

Course Title/Code	**Educational leadership (MOOC-210-EDS-401)**
Course Type	**Elective**
Course Nature	**Soft**
L-T-P-0 Structure	**1-0-2-0**

Credits	2	
Course Objective	Student Readiness in leadership skills	
Course Outcomes (COs)		Mapping
CO1	understand key leadership theories and ideas, from inside and outside education, and apply these to thinking about their own practice	Employability
CO2	draw on evidence from research and practice to develop knowledge with an understanding of what is known about effective leadership	Skill Development
CO3	relate these to their own leadership context in planning actions	Entrepreneurship
CO4	undertake practice-based tasks enabling self-evaluation of their leadership in action	Skill Development
Prerequisites (if any)		

Week 1: Educational Management & Leadership: Issues & challenges
Week 2: Professional Development & the Reflective Practitioner
Week 3: Professional Ethics & Values in Teaching
Week 4: Key Challenges for Educational Leaders: Grooming Capable & Authentic Educational Leaders
Week 5: Emotional Intelligence & Educational Leadership
Week 6: Leadership for Managing Diversity & Inclusion in Education
Week 7: Educational Leadership in a changing World: 21st Century Challenges
Week 8: Innovative Pedagogy, Technology & Turnaround Leadership: The Stakeholders' Perspectives *Reference Books and Readings*

1) Educational Leadership: Key Challenges and Ethical Tensions; Author-Patrick Duignan, Cambridge University Press
2) Educational Leadership: Context, Strategy and ColLaboration; Author- Margaret Preedy, Nigel Bennett and Christine Wise, SAGE publication

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	3	--	3	-	-	-	3	--	3

CO2	2	2	-	-	-	3	--	3	-	-	-	3	--	3
CO3	3	3	-	-	-	3	--	3	-	-	-	3	--	3
CO4	3	3	3	-	-	3	--	3	-	-	-	3	--	3

Course Title/Code	**Peace and Value Education (EDS220)**	
Course Type	**Elective**	
Course Nature	**Soft**	
L-T-P-0 Structure	**1-0-2-0**	
Credits	**2**	
Course Objective	**Student Readiness for value education**	
Course Outcomes (COs)		**Mapping**
CO1	**To understand the nature of values and importance of value education in present day Indian society**	**Employability**
CO2	**To get oriented with the need and role of yoga and meditation for inner harmony**	**Skill Development**
CO3	**To understand impact of social processes on moral development**	**Entrepreneurship**
CO4	**To get oriented with various strategies of value orientation**	**Skill Development**
Prerequisites (if any)		

SECTION A

VALUES: CONCEPTUAL FRAMEWORK

Values - Nature, Sources, Determinants, Social malaise and need for value inculcation, Classification of values, Nature and need of family values, social values, moral values, religious values, environmental values

SECTION B

ESSENTIALS OF VALUE DEVELOPMENT

Value development – a lifelong process, Development of right attitude through introspection and self-control, Human values in relation to Religious Pluralism, Role of Yoga and Meditation

SECTION C

UNDERLYING PERSONAL-SOCIAL PROCESSES

Role of family and community in preservation of culture and value development, Impact of electronic media on value inculcation in children, Value Conflict and Resolution

SECTION D

VALUE EDUCATION: TRANSACTIONAL ASPECTS

Value Education: Meaning and need, Direct approach and integrated approach to Value Education, Co-curricular approach to Value Development, Methods and techniques for inculcation of values, Role of a teacher and institute climate

Reference Books and Readings

CBSE (2012). *Values Education A Handbook for Teachers.* Retrieved from http://cbseacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf

Goel, A. & Goel S. L. (2005). *Human values and Education*. New Delhi: Deep and Deep Publications Pvt. Ltd.

Kulshrestha, S.P. (1979), Emerging Value Pattern of Teachers & Value Pattern of Teachers & New Trends, Education in India, New Delhi: Light & Life Pub.
Passi, B.K. & Singh, P. (1987). *Value Education*. Agra: National Psychological Corporation.
NCERT (2012). *Education for Values in Schools – A Framework*. NCERT: Department of Educational Psychology and Foundations of Education. Retrieved from http://www.ncert.nic.in/departments/nie/depfe/Final.pdf Rokeach, M. (1973). *The nature of human values*. New York: Free Press.
Ruhela, S. P. & Bhargava, V. *Dimensions of Value education*.Agra: H.P. Bhargava Book House Singh,
Samporn (1979) Human Values, Jodhpur: Faith Pub.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	---	2	2	2	-----	1	2	2	2	2	2	2
CO2	----	3	---	2	3	2	---	1	2	2	2	2	2	2
CO3	1	2	1	1	1	2	2	1	2	2	2	2	2	2
CO4	2	2	3	2	3	2	1	1	2	2	2	2	2	2
CO5	2	2	2	1	1	2	1	1	2	----	2	2	----	2

Course Title/Code	**Guidance and Counselling EDS221**	
Course Type	**Elective**	
Course Nature	**Soft**	
L-T-P-0 Structure	**1-0-2-0**	
Credits	**2**	
Course Objective	**To enable a learner to**	
Course Outcomes (COs)		**Mapping**
CO1	**The students will apply the knowledge of guidance and counselling in real life situations**	**Employability**
CO2	**The student will imbibe and demonstrate qualities of an effective counsellor**	**Skill Development**
CO3	**The student will demonstrate various approaches of guidance and counselling**	**Entrepreneurship**
CO4	**The student will effectively use tools for testing and evaluating different techniques for assessment**	**Employability**
Prerequisites (if any)		

SECTION A

GUIDANCE AND COUNSELLING: OVERVIEW

Difference between Guidance and Counselling, Purpose and assumptions of Guidance and Counselling in Education, Types of guidance- Educational, Vocational, and Personal, Types of Counselling: Directive, Non-directive and Eclectic.

SECTION B

GUIDANCE AND COUNSELLING: FUNDAMENTALS

Essentials of a teacher as a Counsellor: Commitment, Confidentiality, Congruence, Empathy, Genuineness, Interpersonal skills, Mental and physical wellbeing, Objectivity, Pace, Positive regard, Understanding Self, Warmth.

Basic counselling skills: Observing, Listening, Rapport building, History taking, Questioning, Responding, Maintaining records/portfolios.

SECTION C

GUIDANCE AND COUNSELLING: INTERVENTIONS

Approaches to Counselling: Humanistic approach, Cognitive behavioral approach, Social learning approach, Integrative approach.

Issues in school requiring Counselling: Abuse, Anxiety, Behavioral problems, Bullying, Career choices, Peer pressure, Reproductive health, Self-image, Stress, Study habits, Substance abuse.

Counselling Exceptional children: Gifted, Talented, Creative; Differently abled.

Career Guidance and Counselling; Factors affecting Vocational choice; Strategies of disseminating Career Information (Individual, group-talks, orientations, workshops, internships, exhibitions); Steps of career counselling (Attending to the need, enabling selfunderstanding, exploring options, forming strategies and plans).

SECTION D

GUIDANCE AND COUNSELLING: OPTIMIZING OUTCOMES

Provisions for Guidance and Counselling in schools: Manpower provisions-Teachers, Counsellors/ psychologists, social workers; Physical provisions -Space, Testing tools (Aptitude Test, Personality Inventories and Interest Inventory), Print material.

Role of a teacher in Guidance and Counselling, Enhancing Guidance and Counselling outcomes through Parent-School partnership.

Reference Books and Readings

1. Bhatnagar,Asha&Gupta,Nirmala. (2000). *Guidance & Counselling -Vol. 1.* New Delhi:Vikas Publishing House.
2. Chandra,Ramesh. (2002). *Guidance &Counselling.* Delhi: Kalpaz Publications.
3. Dave,Indu. (1983).*The Basic Essentials of Counselling.* New Delhi: Sterling Publishers.
4. Chauhan,S.S. (2001). *Principles & Techniques of Guidance*. New Delhi: Vikas Publishing House.

5. Gibson,Robert. (2008). *Introduction to Counselling & Guidance*. New Delhi:Prentice Hall of India.
6. Kalia,H.L. (2006). *Counselling in Schools*. New Delhi: ICON.
7. Nugent, Frank A. (1990). *An Introduction to the Profession of Counselling*. Columbus: Merrill publishing Co.
8. Panda,N.P. *Education & Exceptional Children*. New Delhi: Deep & Deep Publisher.
9. Pietrofesa, J.J, Bernstein, B.& Stanford, S. (1980). *Guidance: An Introduction*. Chicago: Rand McNally.
10. Rao,Narayana. (2004). *Counselling Guidance*.New Delhi: Tata McGraw-Hill.
11. Rao,S.N. (2014).*Guidance &Counselling*. New Delhi: Discovery Publishing House.
12. Shrivastava, K.K. (2006). *Principles of Guidance &Counselling.* New Delhi: Kanishka Publishers and Distributors.
13. Singh,Raj. (1994).*Educational & Vocational Guidance*. New Delhi: Commonwealth.
14. Steffler & Stewart (2008). As in Kinra, A.K. *Guidance and Counselling.* Delhi: Pearson Education.
15. Vashist,S.R. (2001). Methods of Guidance.New Delhi: Anmol Publications.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	2	2	2	2	2	2	2	2
CO2	3	3	2	-	-	-	3	3	1	2	2	1	2	2
CO3	2	2	2	-	-	-	2	2	2	1	2	2	1	2
CO4	1	1	1	-	-	-	2	3	1	1	2	1	1	2

Course Title/Code	**Human Rights in Education (EDS222)**
Course Type	**Elective**
Course Nature	**Soft**
L-T-P-0 Structure	**1-0-2-0**
Credits	**2**

Course Objective	Student Readiness for Human Rights Values	
Course Outcomes (COs)		**Mapping**
CO1	**To inculcate the knowledge of the Human Rights. -To Realize the importance and need of human rights -To Comprehend the role of the Constitution in human rights -To Comprehend the role of human rights in their life**	**Skill Development**
CO2	**To inculcate the knowledge of the Human Rights. -To Realize the importance and need of human rights -To Comprehend the role of the Constitution in human rights -To Comprehend the role of human rights in their life**	**Employability**
CO3	**To inculcate the knowledge of the Human Rights. -To Realize the importance and need of human rights -To Comprehend the role of the Constitution in human rights -To Comprehend the role of human rights in their life**	**Skill Development**
CO4	**To inculcate the knowledge of the Human Rights. -To Realize the importance and need of human rights -To Comprehend the role of the Constitution in human rights -To Comprehend the role of human rights in their life**	**Entrepreneurship**
Prerequisites (if any)		

SECTION A

HISTORICAL BACKGROUND OF HUMAN RIGHTS

Human Rights: Concept, Foundations, and Historical Background; Universal declaration of Human Rights and Indian Constitution Provisions
Constitutional and Institutional safeguards to Human Rights, National Human Rights Commission (NHRC) and its role·

SECTION B

HUMAN RIGHTS EDUCATION

Human Rights Education: Meaning, Objectives, Strategies. Role of Education towards duty- consciousness, Methods of Teaching Human Values, Human Rights Education at Secondary Level Curriculum

SECTION C

VIOLATION AND PROTECTION OF HUMAN RIGHTS

Human Rights Violation: Meaning and factors affecting human rights violation Human Rights Organizations:
UN, UNESCO and Indian constitution

SECTION D

TRENDS OF HUMAN RIGHTS: Growing Advocacy and Declining Trends of Human Rights Role of Media, School and NGOs in protecting Human rights

Reference Books and Readings:

1. Arjun Dev, Source Book on Human Rights, NCERT, New Delhi 2.
Bipan Chandra, India after Independence. Roopa, New Delhi 2000.
3. Borgohain, Bani, Human Rights: Social Justice and political challenge, New Delhi: Kanishka Publishers, 1999
4. Chandra, Ashish, Human Rights and Conflict Resolution, New Delhi: Rajat, 2000.
5. Dev, Arjun and India Arjun Dev and Others, Ed. Human Rights: A source Book, New Delhi: NCERT, 1996.
6. Dhand, Harry, Teaching Human Rights: A handbook, Bhopal: Ashian Institute of Human Rights, 2000.
7. Human Rights in India: Theory and Practice, National Book Trust, 2001
8. Jois, M. Rana, Human Rights and Indian Values, New Delhi: NCTE, 1998.
9. Khanna, S.K., Children and Human Rights, New Delhi: Commonwealth, 1998.
10. Mohanty, Jagannath Ed., Human Rights Education, New Delhi: Deep and Deep Pub., 2000.
11. Pachami, S.K., Children and Human Rights, new Delhi, APH Publishing, 1999.
12. Palai, Arun Kumar, National Human Rights Commission of India: Formation, Functioning and Future Prospects, New Delhi: Atlantic Pub., 1999.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	----	3	---	2	3	2	---	1	2	2	2	2	2	2

CO2	1	2	1	1	1	2	2	1	2	2	2	1	2	2
CO3	2	2	3	2	3	2	1	1	2	2	2	2	1	2

Course Title/Code	**Environment and Education (EDS223)**	
Course Type	**Elective**	
Course Nature	**Soft**	
L-T-P-0 Structure	**1-0-2-0**	
Credits	**2**	
Course Objective	**To develop student Awareness Regarding Environment**	
Course Outcomes (COs)		**Mapping**
CO1	**To understand about the concept of environmental education.**	**Skill Development**
CO2	**To develop sense of awareness about the environmental pollution, and possible hazards and its causes and remedies.**	**Employability**
CO3	**To build up a sense of responsibility towards conservation of environment, bio-diversity, and sustainable development.**	**Skill Development**
CO4	**To widen reasonable understanding about the role of school and education in fostering the idea and learning to live in harmony with nature.**	**Entrepreneurship**
Prerequisites (if any)		

SECTION A

Multidisciplinary nature of environmental studies

Definition, scope and importanc(2 lectures) Need for public awareness.

SECTION B

Natural Resources: Renewable and non-renewable resources

Natural resources and associated problems.
Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
Energy resources: Growing energy needs, renewable and non- renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

SECTION C

ECOSYSTEM

- Concept of an ecosystem.
- Structure and function of anecosystem.
- Producers, consumers anddecomposers.
- Energy flow in theecosystem.
- Ecological succession.
- Food chains, food webs and ecologicalpyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem: - • Forest ecosystem
- Grassland ecosystem
- Desert ecosystem
- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans,estuaries)

SECTION D

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels.
- India as a mega-diversitynation
- Hot-sports of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlifeconflicts.
- Endangered and endemic species ofIndia
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Reference Books and Readings:

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd.Bikaner.
- BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net(R)
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
- Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T.2001,

- Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects,birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hour

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	2	2	----	----	2	2	1	3
CO2	2	2	2	3	2	2	1	2	----	----	2	2	1	3
CO3	2	2	2	1	3	2	2	1	----	----	2	2	2	1
CO4	1	1	2	2	2	2	1	2	----	----	2	2	2	3

SEMESTER - 8										
SUBJECT CODES	**SUBJECT NAME**	****OFFERING DEPARTMENT**	***COURSE NATURE (Hard/Soft/Workshop/ NTCC)**	**COURSE TYPE (Core/Elective /University Compulsory)**	**L**	**T**	**P**	**O**	**NO. OF CONTACT HOURS PER WEEK**	**NO. OF CREDITS**
EDN403	**Reflective Journal**	**EDU**	**NTCC**	**CORE**	**0**	**0**	**0**	**2**	**0**	**2**
EDO404	**Phase-III School InternshipPedagogy-I**	**EDU**	**OUTCOME**	**CORE**	**0**	**0**	**0**	**8**	**0**	**8**
EDO405	**Phase-III School InternshipPedagogy-II**	**EDU**	**OUTCOME**	**CORE**	**0**	**0**	**0**	**8**	**0**	**8**
EDO415	**Action Research**	**EDU**	**OUTCOME**	**CORE**	**0**	**0**	**0**	**2**	**0**	**2**
EDO416	**Case Study**	**EDU**	**OUTCOME**	**CORE**	**0**	**0**	**0**	**2**	**0**	**2**
	TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)				**0**	**0**	**0**	**22**	**0**	**22**

***COURSE NATURE**	**Hard course (H)**: A course having L-T-P and/or O component ; L(Lecture), T(Tutorial), P(Practical) and O(Outcome)									

	Soft Course (S): A course aimed at development of a person's emotional, social, ethical, professional and creative potentials. The course shall have L-P and/or O component

	Workshop course(W): A completely 'hands on' course conducted in Laboratory, aimed at developing application/ implementation/ designing skills of a person. The course shall have P component **Non Teaching Credit Course(N):** The course involves no teaching and has P and O component. Shall include projects, seminars, dissertations etc.

Course Title/Code	**Reflective Journal EDN403**	
Course Type	**Core**	
Course Nature	**NTCC**	
L-T-P-0 Structure	**0-0-0-2**	
Credits	**2**	
Course Objective	**The course aims at developing skill related to Reflective Journal**	
Course Outcomes (COs)		**Mapping**
CO1	**Introspect one's strength and weakness during classroom teaching**	**Employability**
CO2	**Develop a plan of action to channelize one's strength and improve upon the area of concerns**	**Skill Development**
CO3	**Envision himself/ herself as an effective prospective teacher**	**Entrepreneurship**
CO4	**Imbibe the values essential for becoming the reflective and humane practitioner**	**Skill development**
Prerequisites (if any)		

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	--	--	--	--	2	--	--	3	--	--	3
CO2	3	2	2	--	--	--	--	2	--	--	3	--	--	3
CO3	3	2	2	--	--	--	--	2	--	--	3	--	--	3
CO4	3	2	2	--	--	--	--	2	--	--	3	--	--	3

Course Title/Code	**Phase-III School Internship Pedagogy-I EDO404**	
Course Type	**Core**	
Course Nature	**Outcome**	
L-T-P-0 Structure	**0-0-0-6**	
Credits	**8**	
Course Objective	**The course aims at developing skill related to Pedagogy 1**	
Course Outcomes (COs)		**Mapping**
CO1	**Prepare mega lesson plan incorporating essential maxims and principles of teaching**	**Employability**
CO2	**Deliver the lesson plan in the classroom demonstrating desired pedagogical skills and competencies**	**Skill Development**
CO3	**Prepare and utilize the appropriate TLM to facilitate effective teaching**	**Entrepreneurship**
CO4	**Make appropriate use of tools and techniques for effective evaluation of students learning**	**Skill development**
CO5	**Make appropriate use of tools and techniques for effective evaluation of students learning**	**Skill development**
CO6	**Utilize peer feedback as a tool to enhance the teaching effectiveness**	**Skill development**
Prerequisites (if any)		

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	---	2	3	---	---	---	---	---	---	---	---	2

CO2	2	2	---	1	3	3	---	---	---	---	---	---	---	2
CO3	2	2	---	---	3	2	---	---	---	---	---	---	---	2
CO4	2	2	---	---	3	2	---	---	---	---	---	---	---	2
CO5	2	2	3	---	---	---	3	---	---	---	---	---	---	2
CO6	2	2	---	---	---	---	---	3	---	---	2	---	---	2

Course Title/Code	**Phase-III School Internship Pedagogy-II (EDO405)**	
Course Type	**Core**	
Course Nature	**Outcome**	
L-T-P-0 Structure	**0-0-0-6**	
Credits	**8**	
Course Objective	**The course aims at developing skill related to Pedagogy 2**	
Course Outcomes (COs)		**Mapping**
CO1	**Prepare mega lesson plan incorporating essential maxims and principles of teaching**	**Employability**
CO2	**Deliver the lesson plan in the classroom demonstrating desired pedagogical skills and competencies**	**Skill Development**
CO3	**Prepare and utilize the appropriate TLM to facilitate effective teaching**	**Entrepreneurship**
CO4	**Demonstrate effective use of ICT in transacting the curriculum**	**Skill development**
CO5	**Make appropriate use of tools and techniques for effective evaluation of students learning**	**Skill development**
CO6	**Utilize peer feedback as a tool to enhance the teaching effectiveness**	**Skill development**
Prerequisites (if any)		

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	--	2	3	--	--	--	--	--	--	--	--	2
CO2	2	2	--	1	3	3	--	--	--	--	--	--	--	2
CO3	2	2	--	--	3	2	--	--	--	--	--	--	--	2
CO4	2	2	--	--	3	2	--	--	--	--	--	--	--	2

CO5	2	2	3	--	--	--	3	--	--	--	--	--	--	2
CO6	2	2	--	--	--	--	--	3	--	--	2	--	--	2

Course Title/Code	**Action Research EDO415**	
Course Type	**Core**	
Course Nature	**Outcome**	
L-T-P-0 Structure	**0-0-0-2**	
Credits	**2**	
Course Objective	**The course aims at developing skill related to Action Research**	
Course Outcomes (COs)		**Mapping**
CO1	**Identity problems faced during the real classroom situation**	**Skill development**
CO2	**Offer tentative solutions for the identified problems**	**Skill Development**
CO3	**Develop a research based systematic plan of action to solve the problem**	**Entrepreneurship**
CO4	**Execute and evaluate the effectiveness of the solution**	**Skill development**
Prerequisites (if any)		

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	2	--	--	--	--	1	3	--	--	3	--	--
CO2	2	2	2	--	--	--	--	1	3	--	--	3	--	--
CO3	2	2	2	--	--	--	--	1	3	--	--	3	--	--
CO4	2	2	2	--	--	--	1	1	3	--	--	3	--	--

Course Title/Code	Case Study (EDO416)	
Course Type	Core	
Course Nature	Outcome	
L-T-P-0 Structure	0-0-0-2	
Credits	2	
Course Objective	The course aims at developing skill related to Case Study	
Course Outcomes (COs)		Mapping
CO1	Execute and evaluate the effectiveness of the solution	Employability
CO2	Collect relevant information about the case identified	Skill Development
CO3	Explore the probable causes for the present conditions of the identified case	Entrepreneurship
CO4	Propose a plan of action for the improvement/ restoration of the subject	Skill development
Prerequisites (if any)		

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	3	--	--	--	1	1	3	1	--	3	--	--
CO2	3	1	3	--	--	--	1	1	3	1	--	3	--	--
CO3	3	1	3	--	--	--	1	1	3	1	--	3	--	--
CO4	3	1	3	--	--	--	1	1	3	1	--	3	--	--

Course Title/Course Code	CO	Course Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
Atomic Structure & Bonding (CHH135-T)	CO1	Students Will be able to skilled in critical thinking and reasoning for different phenomenon related to structure of atom.	1	1	----	3	----	----	----	----	2	1	----	3	1	----
	CO2	Students Will be able to use various periodic trends having a firm foundation in the fundamentals and application of current chemical and scientific theories.	1	1	----	3	----	----	----	----	2	1	----	3	1	----
	CO3	Students will be Able to develop confidence for self-education and long learning w.r.t. properties of elements	1	1	----	3	----	----	----	----	2	1	----	3	1	----
	CO4	Students will be Able to evaluate and solve chemical problems involving the features of chemical bonding.	1	1	----	3	----	----	----	----	2	1	----	3	1	----
	CO5	Students will be Able to analyze concept and application of MOT and participate and succeed in competitive exams.	1	1	----	3	----	----	----	----	2	1	----	3	1	----
Atomic Structure &	CO1	Learn to run simulation experiment to understand the physical and	1	1	----	3	----	----	----	----	2	1	----	3	1	----

Bonding Lab (CHH135-P)		chemical parameters determination for water														
	CO2	To develop understanding of Acid Base titration	1	1	----	3	----	----	----	----	2	1	----	3	1	----
	CO3	To analyze the concept behind the formation of some organic compounds.	1	1	----	3	----	----	----	----	2	1	----	3	1	----
	CO4	To familiarize students with various spectroscopic instruments, their principle and applications like UV-VIS, IR, NMR and fluoresecence spectroscopy.	1	1	----	3	----	----	----	----	2	1	----	3	1	----
Physics-I (PHH121-T)	**CO1**	Students would be able to understand, explain and demonstrate fundamentals of dynamics of a particle/system of particles and apply work and energy concepts to daily life problems	1	2	3	2	----	1	2	2	3	----	1	3	1	1
	CO2	Students would be able to understand, analyze concept of collisions and hence would be able to evaluate and apply conservation laws on various physical systems	1	2	3	2	----	1	2	2	3	----	1	3	1	1

	CO3	Students would be able to explain and analyze the concepts of central force motion and gravitation and hence apply them on planetary problems and solve and hypothesize problems related to central forces	1	2	3	2	----	1	2	2	3	----	1	3	3	3
	CO4	Students would be able to explain and analyze rotational dynamics. They would also be able to formulate and construct a solution pertaining to it	1	2	3	2	----	1	2	2	3	----	1	3	1	1
Physics-I Lab (PHH121-P)	**CO1**	Students would be able to demonstrate an ability to conduct investigations of practical/technical issues	3	-	-	3	-	3	3	-	-	3	-	-	2	-

		consistent with their level of knowledge and understanding														
	CO2	Demonstrate an ability to analyze data and reach a valid conclusion.	3	-	-	3	-	3	3	-	-	3	-	1	-	-
	CO3	Designing/performing/resolving the experiments to develop their individual capabilities and representing the collective team work.	3	-	-	3	-	3	3	-	-	3	-	-	2	-
Diversity of Microbes and Thallophytes (EDH113 -T)	CO1	Understand the basis and principles of classification of living organisms	2	1	2	--	--	--	--	2	1	1	1	3	1	1

	CO2	Understand the diversity that exists in microorganisms	2	2	2	-----	---	----	---	2	1	1	1	3	1	2
	CO3	Understand the organization, morphological features and various modes of reproduction in Viruses, Bacteria, Algae and Fungi	2	1	2	-----	---	----	---	2	3	1	1	3	3	2
	CO4	Understand the structural diversity in Lichens and their ecological and economic importance	2	1	2	-----	---	----	---	2	3	1	1	3	1	2
	CO5	Understand the various role played by microorganisms in human welfare and would be able to identify some of the diseases caused by microorganisms and study their symptoms	2	1	2	-----	---	----	---	2	3	2	2	3	3	3

Diversity of Microbes and Thallophytes Lab (EDH113-P)	CO1	To enable students to develop the skills of staining and mounting microbes.	-	2	3	-	-	2	1	-	-	-	-	3	--	3
	CO2	To enable students to develop the skill of preparing bacterial cultures	1	1	2	-	-	-	2	-	-	--	-	3	-	3
	CO3	To develop in the student's skill of identifying diseases caused by microorganisms based on their symptoms.	1	-	2	--	-	2	1	-	-	-	-	3	-	3
	CO4	To develop the skill of observing and identifying microbes using temporary and permanent slides.	-	2	3			1	2	--	-	3	-	1	-	-

Calculus and Analytical Geometry-I (MAH117B)	CO1	Understand & apply the concept of application derivatives to find solution of related Problems	2	3	----	3	2	3	2	----	----	----	----	----	1	2
	CO2	Explain and solve problem based on differentiability theorems and their applications	2	3	----	2	2	2	1	----	----	----	----	----	2	2
	CO3	Apply the knowledge of properties of conics to characterize different types of conics	1	2	----	2	2	1	3	----	----	----	----	----	1	1
	CO4	Explain & analyze different types of confocal conics & polar equation of conics	1	1	----	2	2	2	2	----	----	----	----	----	1	1
Animal Diversity-I (EDH114-T)	CO1	Explain the basis and principles of classification of living organisms	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
	CO2	Evaluate and understand the diversity that exists in Protozoa and Porifera	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
	CO3	Remember the organization, morphological features and various modes of reproduction in Cnidaria and Acnidaria	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
	CO4	Explain the morphology and various mode of reproduction in Helminthes.	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
	CO5	Able to identify some of the diseases caused by Helminthes and study their symptoms	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
	CO6	Analyze and understand the diversity of phylum Annelida	2	1	2	-	-	-------	-	2	1	1	1	3	1	1

Animal Diversity -I Lab (EDH114-P)	CO1	To familiarize the students with the basic knowledge and working of microscope	-	2	3	-	-	2	1	-	-	-	-	1	--	--
	CO2	To develop in the students the ability to spot the specimens of various organisms belonging to different phyla	1	1	2	-	-	-	2	-	-	--	-	1	-	-
	CO3	To study the permanent slides of the lower invertebrate phyla	1	-	2	--	-	2	1	-	-	-	-	1	-	-
	CO4	To prepare the temporary mount slides of amoeba and paramecium	-	2	3			1	2	--	-	-	-	1	-	-
Foundations of Education (EDH102-T)	CO1	Assimilate the concept of Education and Its philosophical aspects	---	---	2	3	---	2	----	2	3	3	3	---	3	---
	CO2	Comprehend the Socio Cultural aspect of Education	3	1	2	3	---	3	----	2	3	3	1	---	1	1
	CO3	Discuss the Interdiscilpinary nature of Education	3	3	3	----	---	3	----	2	3	3	---	---	---	3
	CO4	Analyse the contribution of various Indian and western Educationists to Indian Education System	2	----	1	2	3	3	----	2	3	3	3	---	2	2
	CO5	Reflect on the Educational concerns and Issues in the Indian context	1	----	2	3	---	3	---	2	3	2	3	---	1	2
Foundations of Education Lab (EDH102-P)	CO1	Assimilate the concept of Education and Its philosophical aspects	------	------	2	3	-------	2	----	2	3	3	3	-	2	-
	CO2	Comprehend the Socio-Cultural aspect of Education	3	1	2	3	-------	3	----	2	3	3	1	-	3	2

	CO3	Analyse the contribution of various Indian and western Educationists to Indian Education System	2	----	1	2	3	3	----	2	3	3	3	-		1
Developing Soft Skills and Personality (MOOC-21OEDS-101)	CO1	To encourage the all round development of students by focusing on soft skills.	1	2	2	1	-----	-----	2	3	3	3	2	-	2	-
	CO2	To become more effective individual through goal/target setting, self motivation and practicing creative thinking.	1	1	2	1	------	-----	1	3	3	3	1	-	3	2
	CO3	To expose students to right attitudinal and behavioral aspects and to build the same through activities	2	1	2	2	3	------	2	3	3	3	-----	-		1
Communicative English-I (EDS116)	CO1	Demonstrate accuracy in the usage of grammar in their communication	----	1	1	2	3	1	----	2	----	3	3	----	----	----
	CO2	showcase skills while Communicating verbally	----	1	1	3	3	1	2	1	3	3	---	----	1	2
	CO3	Display proficiency while using morphology and syntax of English language	----	1	2	3	2	1	2	1	3	3	---	----	2	2
	CO4	Express themselves accurately in writing	----	1	2	3	2	1	2	1	3	3	---		2	2
	CO5	Use different techniques while reading for comprehension	----	1	2	3	2	1	2	1	3	3	---		1	2
Critical Understanding of ICT in Education-I (CSW114B)	CO1	Describe and demonstrate common computer literacy skills	-	2	3	-	3	2	3	2	-	3	-	-	-	1
	CO2	understand the fundamentals of the internet and perform basic internet skills;	-	2	3	-	2	2	2	1	-	2	-	-	-	2

	CO3	Describe and perform basic word processing skills;	-	1	2	-	2	2	1	3	-	1	-	-	-	1
	CO4	Enhance a word-processed document by including appropriate visual components.	-	1	1	-	2	2	2	2	-	1	-	-	-	1
Co-Curricular Activities EDO144	CO1	Student Teacher will demonstrate skills related to the core values such as professionalism and time management	3	2	-	-	-	-	-	-	3	3	2	3	-	2
	CO2	Student teachers will demonstrate team work and group activities	3	2	1	-	-	-	-	2	1	2	1	3	-	2
	CO3	Student teachers demonstrate skill at organizing and participating in activities related to their cognitive domain	3	3	-	-	-	-	-	1	1	1	1	-	2	2
	CO4	Student teachers will demonstrate skills at organizing and participating in activities related to affective domain	3	2	-	-	-	-	-	3	3	2	3	2	-	3
	CO5	Student teachers will demonstrate skills at organizing and participating in activities related to psychomotor domain	3	3	-	-	-	-	-	3	3	3	2	2	-	3
Environmental Sciences (CHH137)	CO1	Understand and explain the multidisciplinary dimensions of environmental issues.	2	2	1	1	2	2	2	2	----	----	2	2	1	3
	CO2	Understand the primary environmental problelms and and suggest potential solutions	2	2	2	3	2	2	1	2	----	----	2	2	1	3

	CO3	understand and explain about the various groups of plants and animals and their interaction with various ecosystem	2	2	2	1	3	2	2	1	----	----	2	2	2	1

	CO4	Appreciate the principles governing the interactions between social and environmental factors	1	1	2	2	2	2	1	2	----	----	2	2	2	3
States of Matter and Nuclear Chemistry (CHH136-T)	**CO1**	To understand concepts of solids and gaseous state and demonstrate professional knowledge of the physical, social and intellectual development of students	1	2	1	--	--	--	--	2	1	1	1	2	2	1
	CO2	To analyze various properties of liquids and colloids and develop the ability to conduct research in the related thrust area.	1	2	1	--	--	--	--	2	1	1	1	2	2	1
	CO3	To explain the concepts of acids and bases and develop attitude of reflection, social entrepreneurship and innovation	1	2	2	--	--	--	--	2	1	--	1	2	2	1
	CO4	To understand the concepts related to atoms, nucleus and demonstrate the practical and theoretical understanding of core science courses: Botany/zoology/physics/chemistry/mathematics	2	1	1	--	--	--	--	2	1	1	--	3	2	1

	CO5	Understand the concept and application of nuclear chemistry and demonstrate bridging of the gap between academia, industry and society through field based projects and social engagements	**3**	**2**	-	-	-	-	-	**3**	**2**	**1**	-	-	-	-
States of Matter and Nuclear	**CO1**	To introduce the basics of titration for determining strength of unknown – a knowledge highly recommended for industrial work	3	-	-	-	4	-	-	-	-	2	1	2	2	1
Chemistry Lab (CHH136-P)	**CO2**	To identify different parameters (physical and chemical) to assess water quality	3	-	-	-	4	-	-	-	-	2	1	2	2	1
	CO3	To demonstrate the ability to conduct research in different areas like soil analysis, etc	-	2	-	1	-	3	-	-	-	4	-	2	2	1
Elasticity Waves Heat & Thermodynamics (PHH122 -T)	**CO1**	Students would be able to explain, demonstrate the concepts of elasticity, oscillations and waves and solve problems related	-	-	2	1	2	1	-	1	3	3	1	3	3	2
	CO2	Students would be able to explain and compare the concepts and principles in kinetic theory of gasses and hence would be able to apply them on daily scenario.	-	-	2	1	2	1	-	1	3	3	1	3	3	2

	CO3	Students would be able to demonstrate a clear understanding of laws of thermodynamics and apply basic concepts of heat on real life problems. They would further be able to formulate new problems based on thermodynamical laws	-	-	2	1	2	1	-	1	3	3	1	3	3	2
	CO4	Students would be able to compare and apply the concepts of entropy and hypothesize problems related to entropy	-	-	2	1	2	1	-	1	3	3	1	3	3	2
Elasticity Waves Heat	**CO1**	Students will be able to demonstrate an ability to	3	-	-	3	-	3	3	-	-	3	-	3	-	1
& Thermodynamics Lab (PHH122 -P)		conduct investigations of practical/technical issues														
	CO2	they will demonstrate an ability to analyze data and reach a valid conclusion.	3	-	-	3	-	3	3	-	-	3	-	-	2	1
Bryophytes and Pteridophytes (EDH132-T)	CO1	To get acquainted with the structure, classification, and life history of Bryophytes.	2	1	2	---	----	----	---	2	1	1	1	3	1	1
	CO2	To understand the Geological time scale and the importance of fossils.	2	1	2	---	----	----	---	2	1	1	1	3	1	1
	CO3	To get acquainted with the structure, classification, and life history of Pteridophytes.	2	1	2	---	----	----	---	2	1	1	1	3	1	1

	CO4	To analyse the evolutionary trends among Pteridophytes.	2	1	2	---	----	----	---	2	1	1	1	3	1	1
Bryophytes and Pteridophytes Lab (EDH132-P)	CO1	To observe and identify temporary micro-preparations and permanent slides.	2	2	3	-	2	2	-	-	2	3	-	3	-	2
	CO2	Study of the taxa included under Bryophytes and Pteridophytes by observing temporary micropreparations and permanent slides.	3	3	3	-	3	3	-	-	2	3	-	3	-	-
	CO3	Study of the morphology, thallus organization and reproductive structures of taxa studied in Bryophytes and Pteridophytes through permanent slides.	3	2	2	-	3	3	-	-	2	2	-	2	2	-
	CO4	To prepare temporary, doublestained micro-preparations.	2	2	3	-	2	2	-	-	2	3	-	3	2	-
Number Theory, Theory	CO1	Apply the concept of numbers system for higher level.	3	----	2	1	----	3	2	----	3	----	2	3	----	1
of Equations and Matrices (MAH118B)	CO2	Prove results involving divisibility and greatest common divisors;	2	----	2	1	----	3	2	----	2	----	2	3	----	3
	CO3	Find integral solutions to specified linear Equations;	3	----	2	1	----	2	3	----	3	----	3	3	----	2
	CO4	Apply the concept of rank to solve system of equation.	2	----	2	1	----	2	3	----	2	----	2	3	----	3
	CO5	Analyze the concept of Eigen value's and eigen vectors and their properties.	3	----	2	1	----	3	2	----	3	----	3	3	----	----
Animal Diversity-II (EDH131-T)	CO1	Critically analyse the basic structure, classification and life history of Arthropoda, Mollusca and Echinodermata	2	1	1	-----	3	1	-----	2	1	1	1	3	3	3

	CO2	Comprehend the systemic position and phylogeny of Onychophoran	2	1	1	-----	3	1	-----	2	1	1	1	3	3	3
	CO3	Reflect upon the classification of Mollusca and to gain the knowledge of formation of the pearl	2	1	1	-----	3	1	-----	2	1	1	3	3	3	3
	CO4	To have the Knowledge of the evolutionary trends among arthropoda, mollusca and echinodermata	2	1	1	-----	3	1	-----	2	1	1	1	3	3	3
	CO5	Critically analyze the classification Of Protochordata	2	1	1		2	1		2	1	1	3	3	3	3
	CO6	Critically analyze the classification and life history of Cylostomata	2	1	1		2	1		2	1	1	1	3	3	3
Animal Diversity-II Lab (EDH131-P)	CO1	To develop in the students the skills of staining and mounting of materials (temporary and	-	2	3	-	-	2	1	-	-	-	-	1	3	2
		permanent); of dissection, display and Labelling														
	CO2	To develop in the students the skills of collection, preservation, mounting of specimens	1	1	2	-	-	-	2	-	-	--	-	1	3	3
	CO3	To develop in the students the skills of identification and Labelling of collected specimens	1	-	2	--	-	2	1	-	-	-	-	1	3	3

	CO4	To develop in the students the skills of field observation of animals	-	2	3			1	2	--	-	3	-	-	2	3
Calculus and Analytical Geometry-II (MAH119B - T)	CO1	understand and analyse the various shape of 3D structures	2	----	2	1	----	3	2	----	2	----	2	3	----	3
	CO2	apply the concept of limit, continuity and differentiability of the function of two variable	3	----	2	1	----	2	3	----	3	----	3	3	----	2
	CO3	apply the concept of Reduction Formula in integaral calculus and to find the volume and surface area of of solid of revolution	2	----	2	1	----	2	3	----	2	----	2	3	----	3
Maths Lab (MAH120B)	CO1	get the basic understanding of Mathematical software	3	----	2	1	----	2	3	----	3	----	3	3	----	2
	CO2	use various commands avaiLable in Mathematical software to find limit continuity and differentiability	2	----	2	1	----	2	3	----	2	----	2	3	----	3
	CO3	implement the commands in Mathematical problems.to	3	----	2	1	----	3	2	----	3	----	2	3	----	1
		compute differentiation ,integration														
	CO4	implement the commands in finding maxima, minima, application of integrals	2	----	2	1	----	3	2	----	2	----	2	3	----	3

Creating An Inclusive Classroom (EDS103)	CO1	To understand the meaning and need of inclusion in education	3	1	1	2	---	---	1	1	2	2	1	3	--	2
	CO2	To get familiarized with various policies, programmes and schemes promoting inclusive education	2	2	1	2	---	1	1	---	2	1	1	2	--	3
	CO3	To identify the social, economic, and physical diversity that exists amongst learners	2	3	2	3	1	3	2	1	2	3	1	3	1	-
	CO4	To recognize the challenges in Inclusive Education	3	3	1	2	2	2	2	2	2	2	1	2	1	-
Learner and Learning Process (EDH133-T)	CO1	Comprehend the Nature of both the Psychology of the learner and Learning	2	1	1	1	1	1	2	2	3	3	----	3	----	----
	CO2	Assimilate the nature of different components of cognition and their role in producing learning	3	2	1	1	1	1	2	2	3	3	3	----	3	2
	CO3	Apply the knowledge of concepts and principles of growth in the classroom situation	---	1	1	1	1	1	2	1	2	3	3	3	---	2
	CO4	Elucidate the concept of Group dynamics in their day-to-day activities.	2	1	1	1	1	1	1	1	2	3	3	---	2	2
	CO5	Exhibit all the traits of an effective teacher	1	1	1	1	1	1	2	1	2	3	3	---	2	2

Learner and Learning Process Lab	CO1	To develop teaching aids as per interests and capabilities of the learners	3	2	3	2	3	---	2	2	1	2	--------	3	-------	-------

(EDH133-P)	CO2	To assign tasks /develop assignments as per the abilities of the learners	1	2	2	3	3	2	1	2	1	1	3	-------	3	2
	CO3	To enable a learner to test various factors of personality of an individual	3	2	3	2	1	----	1	3	1	2	3	3	-------	2
Spoken English/Speaking Effectively (MOOC-18EEDS-103)	CO1	To build up the vocabulary.	-	3	3	3	-	-	-	3	1	-	3	3	1	-
	CO2	To improve the pronunciation skill.	-	3	-	2	1	-	-	3	-	-	-	3	-	-
	CO3	To make presentations precisely, logically and effectively.	-	3	-	2	-	-	-	3	-	-	-	3	-	-
	CO4	To read and comprehend the major points discussed in various types of written texts.	-	3	3	1	-	1	-	3	-	-	3	3	-	-
Communicative English-II (EDS134)	CO1	Demonstrate accuracy in the usage of grammar in their communication	**----**	**1**	**1**	**2**	**3**	**1**	**----**	**2**	**----**	**3**	**1**	**3**	**1**	**-**
	CO2	showcase skills while Communicating verbally	**----**	**1**	**1**	**3**	**3**	**1**	**2**	**1**	**3**	**3**	**1**	**2**	**--**	**3**
	CO3	Display proficiency while using morphology and syntax of English language	**----**	**1**	**2**	**3**	**2**	**1**	**2**	**1**	**3**	**3**	**1**	**3**	**1**	**-**
	CO4	Express themselves accurately in writing	**----**	**1**	**2**	**3**	**2**	**1**	**2**	**1**	**3**	**3**	**1**	**2**	**1**	**-**
Critical Understanding of ICT in Education-II/(CSW115B)	CO1	Understanding basic conditional formatting and Implement filters on data for analysis.	-	1	3	-	3	2	3	2	-	-	-	-	-	1
	CO2	Create pivot table for data analysis and Lookup operation on data.	-	1	3	-	3	2	3	1	-	-	-	-	-	1

	CO3	Configure google site: header,pages,link, image and Configure Google Suite to colLaborate and publish.	-	1	2	-	3	3	1	3	-	3	-	-	-	2
	CO4	To implement basic programming logic using Turtle Block.	-	1	1	-	2	1	1	1	-	-	-	-	-	1
Drama and Art Education (EDW125)	CO1	To develop the skills to use visual art in teaching learning process effectively.	1	2	1	3	2	1	1	2	1	1	2	-	-	1
	CO2	To develop the skills to use literary art in teaching learning process effectively.	1	2	1	3	2	1	1	2	1	1	2	1	-	2
	CO3	To develop the skills to use performing art in teaching learning process effectively.	1	2	1	3	2	1	1	2	1	1	2	1	-	1
	CO4	To develop the skills to integrate technology and art in teaching learning process effectively.	1	2	1	3	3	1	1	2	1	1	2	-	-	1
Project Report on Field Trip (EDN136)	CO1	To develop skills related to the core competencies like commitment to prefession and honouring diversity	2	2	-	-	-	-	-	-	2	2	-	1	-	1
	CO2	To develop skills including communication and problem solving	2	2	-	-	-	-	-	-	2	2	-	-	2	--
	CO3	To develop skills like sensitization towards the environment and solving imminent problems	2	1	-	-	-	-	-	-	2	2	-	-	-	3
	CO4	To develop skills like team work, co-operation and leadership	2	2	-	-	-	-	-	-	2	2	-	-	1	

Post Second Semester Summer	CO1	To develop skills like school sensitization and solving imminent problems	1	3	___	___	___	___	___	___	___	___	___	2	1	___
Training (EDO 165)																
	CO2	To develop skills like team work, co-operation and leadership	1	3	___	___	___	___	___	___	___	___	___	_	3	___
Organic Chemistry-I (CHH237-T)	CO1	**To Understand the stereochemistry of organic compounds and its applications.**	2	1	2	-	-	-		2	1	1	1	2	1	1
	CO2	**To establish a basic concept for structure, properties and reactivity of aliphatic hydrocarbons.**	2	1	2	--	--	--	--	2	1	1	1	2	1	1
	CO3	**To develop a firm foundation for scientific application of aromatic hydrocarbons**	1	1	2	--	--	--	--	2	1	1	1	2	1	1
	CO4	**To apply knowledge to communicate reactions and mechanism in alkyl halides**	2	1	2	--	--	--	--	2	1	1		3	1	1
Organic Chemistry I Lab (CHH 237-P	CO1	To Understand the stereochemistry of organic compounds and its applications.	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**1**	**-**	2	1	-
	CO2	To establish a basic concept for structure, properties and reactivity of aliphatic hydrocarbons.	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**1**	**-**	1	-	3

	CO3	To develop a firm foundation for scientific application of aromatic hydrocarbons	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	3	**1**	**-**	-	2	1
	CO4	To apply knowledge to communicate reactions and mechanism in alkyl halides	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**1**	**-**	1	1	2
Electricity and Electromagn	CO1	Students would be able to understand, explain and demonstrate about vector	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
etism (PHH226-T)		calculus, Gauss law and its application to determined D with problems and diagrams.														
	CO2	Students would be able to understand, construction and working of different types of capacitors. Also they will able to understand polarization phenomenon.	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
	CO3	Students would be able to understand about Biot Savarts law, Ampers law and different types of forces in magnetostatics.	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
	CO4	Students would be able to understand about propagation of electromagnetic waves and electromagnetic induction.	2	1	2	-----	------	-------	------	2	1	1	1	3	1	1
Electricity and Electromagn etism Lab (PHH226-P)	CO1	Students would be able to understand, explain and demonstrate about vector calculus, Gauss law and its	-	2	3	-	-	2	1	-	-	-	-	1	--	--

		application to determined with problems and diagrams.														
	CO2	Students would be able to understand, construction and working of different types of capacitors. Also they will able to understand polarization phenomenon.	1	1	2	-	-	-	2	-	-	--	-	1	-	-
	CO3	Students would be able to understand about Biot Savarts law, Amperes law and different types of forces in magnetostatics.	1	-	2	--	-	2	1	-	-	-	-	1	-	-
	CO4	Students would be able to understand about propogation of electromagnetic waves and electromagnetic induction.	-	2	3			1	2	--	-	-	-	1	-	-
Gymnosperms and Reproduction in Angiosperms (EDH204 -T)	CO1	Understand the General characteristics, classification and economic importance of Gymnosperms	2	1	1	----	-----	----	-----	2	2	1	1	3	1	2
	CO2	Understand the diverse structural and morphological characteristic features of Angiosperm Flower	2	1	1	----	-----	----	-----	2	3	1	1	3	1	1
	CO3	Understand the development of male and female gametophyte	2	1	1	----	-----	----	-----	2	1	1	1	3	1	1

	CO4	Describe Pollination and Fertilization. Different types of Endosperm, Fruit and Seed	2	1	1	----	-----	----	-----	2	2	1	1	3	1	1
Gymnosperms and Reproduction in Angiosperms Lab (EDH204 -P)	CO1	To enable students to identify temporary slides of Gymnosperms and Angiosperm Embryology.	2	2	3	-	-	-	-	3	2	2	-	3	--	3
	CO2	To enable students to identify permanent slides of Gymnosperms and Angiosperm Embryology.	1	1	2	-	-	-	-	3	3	--	1	3	-	3
	CO3	To develop among students skills of free hand sectioning, staining and mounting embryological materials.	1	1	2	--	-	-	-	3	3	1	1	3	-	3
	CO4	To describe characteristics of Gymnosperms and	1	2	3			-	-	2	2	2	2	1	-	1
		Angiosperms on basis of slide studies														
Real Analysis (MAH219B)	CO1	Understand many properties of the real line $\mathbb{R}$ and learn to define sequence in terms of functions from $\mathbb{R}$ to a subset of $\mathbb{R}$.	2	----	1	2	3	----	----	----	2	----	1	3	3	3
	CO2	Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.	2	----	1	2	3	----	----	----	2	----	1	3	2	2

	CO3	Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.	2	----	1	2	3	----	----	----	2	----	1	3	3	3
	CO4	Apply some of the properties of Riemann integrable functions.	2	----	1	2	3	----	----	----	2	----	1	2	1	1
	CO5	Understand the applications of the fundamental theorems of integration.	2	----	1	2	3	----	----	----	2	----	1	3	2	2
Animal Diversity III and Comparative Anatomy Of Vertebrates (EDH205-T)	CO1	To understand and analyse characteristics of Pisces	2	1	2	-----	3	----	-----	2	1	1	1	3	3	3
	CO2	To Understand basic characteristics of amphibians and parental care	2	1	2	-----	3	----	-----	2	1	1	1	3	3	3
	CO3	To understand and analyse hierarchy in reptiles and aves	2	1	2	-----	3	----	-----	2	1	1	1	3	3	3
	CO4	To develop the understanding of evolutionary trends in Mammalia	2	1	2	-----	3	----	-----	2	1	1	1	3	3	3
	CO5	To develop the understanding of heart and aortic arches	2	1	2	-----	3	--	--	2	1	1	1	3	3	3

	CO6	To understand the structure and evolution of kidneys and gonads in vertebrates	2	1	2	-----	3	-----	-	2	1	1	1	3	3	3
Animal Diversity III and Comparative	CO1	To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection	-	2	3	-	-	2	1	-	-	-	-	1	--	--

Anatomy of Vertebrates Lab (EDH205-P)	CO2	To develop in the students the skills of display and Labelling; of micro techniques of fixing, embedding, section cutting, staining and mounting	1	1	2	-	-	-	2	-	-	--	-	1	-	-
	CO3	To develop in the students the skills of collection, preservation, mounting, identification and Labelling of collected specimens	1	-	2	--	-	2	1	-	-	-	-	1	-	-
	CO4	To develop in the students the skills of field observation of animals	-	2	3			1	2	--	-	-	-	1	-	-
Basics of Biophysics (EDH221-T)	CO1	Understand and explain basic concepts of Biophysics	2	1	3	---	---	---	---	2	---	---	---	3	2	1
	CO2	Understand and explain the multidisciplinary dimensions of biophysics	2	1	3	---	---	---	---	2	---	---	---	2	3	1
	CO3	Understand the principles of Biophysics and underlying fundamentals	2	1	3	---	---	---	---	2	---	---	---	2	2	1
	CO4	Understand and explain about the various Bio-molecular mechanisms	2	1	3	---	---	---	---	2	---	---	---	2	1	---
	CO5	Appreciate the invention of instruments for welfare of human beings and life	2	1	3	---	---	---	---	2	---	2	3	2	3	3

Basics of Biophysics	CO1	Demonstrate skills used to analyze biomolecules using various biophysical techniques.	2	1	3	-----	-----	-----	-----	2	2	-----	1	3	1	-

Lab (EDH221-P)	CO2	Demonstrate proficiency in using optical microscopes to study biological specimens and slides.	2	1	3	-----	-----	-----	-----	2	2	-----	1	2	1	-
	CO3	Demonstrate use of bioinformatic tools to analyse sequence and structure of biomolecules	2	1	3	-----	-----	-----	-----	2	2	-----	1	3	----	----
Knowledge and Curriculum (EDH216-T)	CO1	Explain the concept of knowledge and its relationship with various aspects of curriculum Development	2	3	2	3	-	1	-----	2	1	2	2	3	3	3
	CO2	Analyse epistemological thoughts of various Indian and western educationists with regard to significant aspects of curriculum	3	2	2	3	1	2	-	2	1	2	2	3	3	3
	CO3	Infer the interrelationship among Eduation,social forces and curriculum development	2	3	3	2	-	1	------	2	3	3	3	3	2	1
	CO4	Assimilate the process of curriculum development with all its significant components	1	2	2	3	-	1	2	1	2	2	2	----	-----	----
	CO 5	Reflect on the role of National Level institutions in curriculum Planning	1	2	1	1	-	-------	1	1	2	1	2	------	3	3
Knowledge and Curriculum Lab (EDH216-P)	CO1	To discuss the educational thoughts of great educational thinkers on child centered education	2	3	2	3	-	1	-----	2	1	2	2	3	3	3
	CO2	Analyse epistemological thoughts of various Indian and western educationists with regard to significant aspects of curriculum	3	2	2	3	1	2	-	2	1	2	2	3	3	3
	CO3	To comprehend curriculum process and practice	2	3	3	2	-	1	------	2	3	3	3	3	2	1

Gender, School and Society (EDS207)	CO1	To develop a positive notion on sexuality amongst young people.	2	2	2	2	2	2	3	3	3	3	3	1	-	2
	CO2	To identify social construction of gender under the lens of class and caste intersectionality	3	2	3	1	2	2	1	2	3	1	2	2	2	-
	CO3	To analyse the role of schools in promoting gender equality through value education.	1	3	2	2	1	3	2	1	3	2	3	2	1	1
	CO4	To develop a strategic approach towards women empowerment with the support of government agencies	1	1	3	2	1	2	2	1	3	2	3	3	-	-
Craft and Visual Arts (EDW208)	CO1	To demonstrate awareness and understanding of craft and visual art forms	2	--	--	2	--	--	--	--	--	2	2	1	2	-
	CO2	To demonstrate skill at integrating craft and visual art for effective teaching	2	---	---	---	2	2	---	---	---	2	2	1	1	2
	CO3	To demonstrate aesthetic sensibility to respond through expression	2	2	--	2	2	2	---	1	--	2	2	1	-	2
	CO4	To demonstrate imagination through participation in craft and visual art activities	2	--	--	--	2	1	---	1	---	2	2	-	3	-
Spanish-I (FLS101)	CO1	Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.	2	3	3	-	-	-	-	-	-	-	-	1	2	-

	CO2	Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes.	2	3	3	-	-	-	-	-	-	-	-	1	1	-
	CO3	Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.	1	3	3	-	-	-	-	2	1	-	-	1	-	2
	CO4	Students will be able to understand audio text and comprehend to the same. They will be able to form paragraph using auxilary verb and basic verbs.	1	1	2	-	-	-	-	3	1	-	-	-	3	-
	CO5	Students will be introduced to French culture and civilization. They will be able to describe various places and locations of Francophonic countries.	1	1	3	-	-	-	-	3	2	-	-			
German-I/ FLS102	CO1	Students will be able to know the living standard of Germany and can learn the comparison with their native country like the types of houses Germans have and the type of houses they have in their country.	1	3	3	-	-	-	-	2	1	-	-	-	-	2
	CO2	Students will be able to identify belongingness of the objects like	-	3	2	3	-	-	-	-	-	1	-	-	-	-

		what belongs to them or what belongs to someone else.														
	CO3	Students will be able to describe their daily routine in German language. They will be able to learn timings as well.	2	3	3	-	-	-	-	-	-	-	-	-	-	1
	CO4	Students will be able to learn informal letter writing like they can mention their daily routine to their friend.	2	3	3	-	-	-	-	-	-	-	-	-	-	1
French-I/FLS103	CO1	Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.	2	3	3	-	-	-	-	-	-	-	-	-	-	1
	CO2	Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes.	2	3	3	-	-	-	-	-	-	-	-	-	-	1
	CO3	Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.	1	3	3	-	-	-	-	2	1	-	-	-	-	2

	CO4	Students will be able to understand audio text and comprehend to the same. They will be able to form paragraph using auxilary verb and basic verbs.	1	1	2	-	-	-	-	3	1	-	-	-	-	1
	CO5	Students will be introduced to French culture and civilization. They will be able to describe various places and locations of Francophonic countries.	1	1	3	-	-	-	-	3	2	-	-	-	-	3
Thermodynamics, Equilibrium & Solutions/ CHH238 -T	CO1	To develop an understanding of the chemistry heat of neutralization of acids and bases	1	1	1	-	-	-	-	-	-	-	1	-	1	-
	CO2	To develop basic skills for Verification of Hess's law of constant heat summation	1	1	2	-	-	2	-	-	-	-	1	-	1	-
	CO3	Learn Determination of dissociation constant of a weak acid in Physical chemistry Laboratory	1	1	-	-	1	-	-	-	1	-	1	-	1	-
	CO4	Perform determination of dissociation constant of phenolphthalein/methyl orange by colorimeter	1	1	1	-	3	1	-	-	1	-	1	-	1	-

Thermodynamics, Equilibrium & Solutions CHH238 -P	CO1	To understand that conservation of energy is the central concept which governs all the changes and to appreciate its role in various thermo chemical equations.	1	-	1	-	-	-	-	-	-	-	1	-	1	-
	CO2	Explain the origin of the driving force of physical and chemical changes and evolution of second law of thermodynamics and related concepts	1	-	2	-	-	2	-	-	-	-	1	-	1	-
	CO3	To apply the concept of equilibrium to construct and interpret the phase diagrams.	1	-	-	-	1	-	-	-	1	-	1	-	1	-
	CO4	To relate the measurement of colligative properties with molar mass to analyze van't Hoff factor for association and dissociation of non-volatile solutes in solutions	1	-	1	-	3	1	-	-	1	-	1	-	1	-
Organic Chemistry-II (CHH313-T)	CO1	To develop an understanding of the chemistry of Functional groups and mechanisms of Organic Reactions.	1	2	2	2	1	1	--	1	--	--	--	3	2	1
	CO2	To develop basic skills of separation of organic compounds and evolve a scheme of analysis of organic compounds based on properties	1	2	2	2	2	1	--	1	--	--	--	2	2	1

		of functional groups for identification														
	CO3	Learn the properties, synthesis and chemical reactions of halogen and/or oxygen containing functional groups in organic chemistry	1	2	2	1	2	1	--	1	--	--	--	1	2	1
	CO4	Perform inter-conversions of various functional groups in organic chemistry.	1	2	2	2	2	1	--	1	--	--	--	1	1	1
Organic Chemistry-II Lab (CHH313 -P)	CO1	To develop an understanding of the chemistry of Functional groups and mechanisms of Organic Reactions.	2	2	3	3	-	-	-	-	3	1	-	-	2	3
	CO2	To develop basic skills for the analysis of organic compounds based on properties of functional groups for identification	2	2	3	3	-	-	-	-	3	1	-	-	2	3
	CO3	Learn the properties, synthesis and chemical reactions of halogen and/or oxygen containing functional groups in organic chemistry Laboratory	2	2	3	3	-	-	-	-	3	1	-	-	2	3
	CO4	Perform inter-conversions of various functional groups experimentally	2	2	3	3	-	-	-	-	3	1		-	2	3
Optics (PHH227-T)	CO1	Students would be able to understand about interference of light.	3	1	2	-----	1	------	-----	2					1	
	CO2	Students would be able to understand about diffraction of light.	2	1	2	-----	1	------	-----	2	1	1	1	3	1	1

	CO3	Students would be able to understand about polarisation of light.	2	1	2	1	-----	1	-----	2	1		1	3		1

	CO4	Students would be able to understand about LASER and Optical fiber.	2	1	2	-----	-----	------	-----	2	1	1	1	3	1	1
Optics Lab (PHH227-P)	CO1	Students would be able to understand about interference of light.	2	2	3	-	-	2	1	-	-	-	-	1	--	--
	CO2	Students would be able to understand about diffraction of light.	1	1	2	-	-	-	2	-	-	--	-	1	-	-
	CO3	Students would be able to understand about polarisation of light.	1	-	2	--	-	2	1	-	-	-	-	1	-	-
	CO4	Students would be able to understand about LASER and Optical fiber.	2	2	3			1	2	--	-	-	-	1	-	-
Angiosperm Anatomy, Evolution and Economic Botany (EDH224 -T)	CO1	Understand the development, organization and functions of various plant tissues in angiosperms	1		2	----	----	----	----	1	2	1	1	3	1	1
	CO2	Understand the diversity of histological complexity in Angiosperms.	1		2	----	----	----	----	1	2	1	1	3	1	1
	CO3	Understand Evolution and economic importance of plants	1		2	----	----	----	----	1	2	1	1	3	1	1
	CO4	Understand the secondary growth in root and stem.	1		2	----	----	----	----	1	2	1	_	2	3	1

Angiosperm Anatomy, Evolution and Economic Botany (EDH224-P)	CO1	To develop the skill of free hand sectioning, staining and mounting of plant parts for anatomical study.	2	2	3	2	2	2	3	3	2	3	3	3	1	1
	CO2	To observe and identify different types of tissues using	3	3	3	2	3	3	3	3	2	3	3	3	1	1
		temporary and permanent slides.														
	CO3	To study the anomalous secondary growth of Bougainvillea.	3	2	2	2	3	3	3	3	2	2	2	3	1	1
	CO4	To give a brief account (botanical name, family, extraction/ processing where necessary) and uses of various economically beneficial plants.	2	2	3	2	2	2	2	3	2	3	2	2	3	1
Multivariate Calculus & Vector Calculus (MAH220B)	CO1	Apply change of variables, change of order of integration involving double and triple integrals.	3	1	3	1	----	----	----	----	----	----	----	3	----	----
	CO2	Apply the concept of triple integral to evaluate volume of region.	3	1	3	1	----	----	----	----	----	----	----	3	----	----
	CO3	Analyse problems related to improper integrals.	3	1	3	1	----	----	----	----	----	----	----	3	----	----

	CO4	Explain physical meaning of gradient of a scalar field, curl and divergence in terms of fluid flow and also be able to evaluate line integrals, surfaceintegrals and volume integrals	3	1	3	1	----	----	----	----	----	----	----	3	----	----
	CO5	Solve & analyze the Mathematical problems related to Integral calculus & vector calculus and its applications using mathematical software.	3	1	3	1	3	----	----	----	----	----	----	3	----	----
	CO1	Compute measures of central tendency & measures of	1	1	2	---	---	---	---	1	1	2	---	3	2	1
Probability & Statistics (MAH221B-T)		dispersion and solve related problems in the real world.														
	CO2	Assess the shape and peakness of data and calculate the various methods of measurements	1	1	2	---	---	---	---	1	1	2	---	3	2	1
	CO3	Apply correlation and regression techniques to check the dependency in data.	1	1	2	---	---	---	---	1	1	2	---	3	2	1
	CO4	Apply the concept of probability theory and probability distributions to solve related problems.	1	1	2	---	---	---	---	1	1	2	---	3	2	1
	CO5	Apply the knowledge of sampling theory to analyse and interpret given data.	1	1	2	---	---	---	---	1	1	2	---	3	2	1

Probability & Statistics Lab (MAH221B-P)	CO1	Create graphical representation of Data using Charts & Diagrams in Excel	1	1	2	---	---	---	---	2	---	---	---	3	2	1
	CO2	Compute Measures of Central Tendency, measures of Dispersion and coefficient of skewness in Excel	1	1	2	---	---	---	---	2	---	---	---	3	2	1
	CO3	Analyse data dependency using correlation & regression techniques in excel	1	1	2	---	---	---	---	2	---	---	---	3	2	1
	CO4	Calculate probability of various distributions	1	1	2	---	---	---	---	2	---	---	---	3	2	1
	CO5	Apply Statistical and probability distributions on Real time data and analyse the same.	1	1	2	---	---	---	---	2	---	---	---	3	2	1

Animal Physiology and Endocrinology (EDH225-T)	CO1	Comprehend the enzyme action and physiology of digestion	1	1	2	-----	3	----	-----	2	3	1	1	3	3	3
	CO2	Critically analyse the complexity of respiration and understand the mechanism of transport of gases	1	1	2	-----	3	----	-----	2	1	1	1	3	3	3
	CO3	Reflect upon the mechanism of blood circulation, blood clotting and functioning of human heart	1	1	2	-----	--	2	-----	2	1	1	1	3	2	3
	CO4	Explain the process of excretion and homeostasis	1	1	2	-----	1	----	-----	2	1	1	1	3	3	3

	CO5	Explain the process of excretion and homeostasis	1	1	2	-	1	-	-----	2	1	1	1	3	3	3
	CO6	To conceptualize the mechanism of endocrine and exocrine glands	2	1	2	-	1	-	-----	2	1	1	1	3	3	3
Animal Physiology and Endocrinology Lab (EDH225-P)	CO1	To enable students to analyse biochemically the foodstuffs and urine	1	2	3	---	---	2	1	---	---	---	---	3	---	3
	CO2	To enable students to analyse the biochemical action of enzymes	1	1	2	---	---	-	2	---	---	---	---	3	---	3
	CO3	To develop in the students the skills of separation of macro molecules using chromatography and electrophoresis	1	---	2	---	---	2	1	---	---	---	---	3	---	3
	CO4	To demonstrate physiological experiments and the skills of haematology and endocrinology	1	2	3	---	---	1	2	---	---	3	---	1	---	---

Assessment for Learning (EDH122-T)	CO1	To develop a critical understanding of issues in assessment and evaluation	2	1	1	1	1	1	2	2	3	3	----	3	----	----
	CO2	To justify the role of continuous and comprehensive assessment in holistic development	3	2	1	1	1	1	2	2	3	3	3	----	3	2
	CO3	To choose appropriate assessment methods	----	1	1	1	1	1	2	1	2	3	3	3	----	2

	CO4	To design learning indicators and rubrics as a part of assessment	2	1	1	1	1	1	1	1	2	3	3	----	2	2
	CO5	To devise ways to record and report learning landmarks to be supported by feedback	1	1	1	1	1	1	2	1	2	3	3	----	2	2
	CO6	To develop the habit of selfcritiquing to improve performance.														
Assessment for Learning Lab (EDH122-P)	CO1	Develop critical thinking and scientific temper	3	3	2	1	1	1		1	2	1	3			
	CO2	To justify the role of continuous and comprehensive assessment in holistic development	1	3	3	2	1	---	1	3	1	2	----			
	CO3	Acquire skills to develop digital assessment tools for various learner groups	2	3	2	1	3	2	3	--	2	----	3			
School Organisation and Management (EDS227)	CO1	Use various strategies to create positive school climate	3	3	3	2	---	2	----	3	---	2	2	----	2	3
	CO2	Analyse various features of school as an organization.	----	----	3	3	---	3	---	3	----	2	2	-----	2	3
	CO3	Discuss different components of school management	----	----	3	3	----	3	----	3	----	2	2	---	2	3
	CO4	Assimilate the concept and process of educational administration	1	1	3	2	---	2	----	3	---	2	2	----	2	3
Design	CO1	To know about design thinking	1	1	1	0	0	1	---	0	---	0	0	---	1	1

Thinking: A Primer (MOOC-18E-EDN-205)	CO2	To learn about customer journey mapping	1	1	1	0	0	0	0	0	0	0	---	---	2	2
	CO3	To know about the analysis phase of design thinking	1	1	2	0	0	1	0	1	0	0	---	---	2	1
	CO4	To know about the ideation phase of design thinking	1	1	2	0	0	1	0	0	0	0	---	---	2	2
Street Play/Skit/Mime (EDN229)	CO1	To develop a social sensitivity	1	1	---	---	---	---	---	---	---	1	1	1	1	1
	CO2	understand and identify the social needs of society	1	1	---	---	---	---	---	---	---	1	1	1	1	1
	CO3	To organize camps related with social issues	1	1	---	---	---	---	---	---	1	1	1	1	1	1
Principles of Management/ MOOC-18E-EDS-204	CO1	To know about staffing/recruitment	1	1	----	----	----	----	----	----	----	1	1	1	1	1
	CO2	To explore performance management and appraisal process	1	1	----	----	----	----	----	----	----	2	1	1	1	1
	CO3	To explore training and development	1	1	----	----	----	----	----	----	----	2	1	1	1	1
	CO4	To evaluate processes of career management	1	1	----	----	----	----	----	----	----	2	1	1	1	1
Basics of Economics / MCS231	CO1	To comprehend the economic problems of the society.	2	1	1	1	---	---	---	---	3	2	2	---	2	2
	CO2	To Enlighten the laws of utility, demand and supply and their measurement.	1	1	1	1	---	---	---	---	1	1	1	---	1	1
	CO3	To Explain the laws of production and various concepts of costs.	2	1	2	1	---	---	---	---	1	2	3	---	2	3

	CO4	To eLaborate the various market forms	2	1	---	---	---	---	---	---	3	1	1	---	1	1
Introduction to Finance (MCS232)	CO1	To take an overview of Financial management and its need to take financial decisions.	3	2	1	---	3	2	1	---	---	---	---	---	2	2
	CO2	To understand financial statements and distinguishes between profit & loss and Balance sheet of different business organizations.	3	2	1	---	3	2	1	---	---	---	---	---	1	1
	CO3	To identify the different sources of long term finance and differentiate amongst equity, preference and Debt	3	2	1	---	3	2	1	---	---	---	---	---	2	3
	CO4	To eLaborate and apply various techniques of capital budgeting and analyse cost of capital and capital structure	3	2	1	---	3	2	1	---	---	---	---	---	1	1
Spanish-II/ FLS105	CO1	Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.	2	3	3	-	-	-	-	-	-	-	-		2	2
	CO2	Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes.	2	3	3	-	-	-	-	-	-	-	-		1	1

	CO3	Describe themselves, other people, familiar places and objects in short discourse using	1	3	3	-	-	-	-	2	1	-	-		2	3

		simple sentences and basic vocabulary.														
	CO4	Students will be able to understand audio text and comprehend to the same. They will be able to form paragraph using auxilary verb and basic verbs.	1	1	2	-	-	-	-	3	1	-	-		1	1
	CO5	Students will be introduced to French culture and civilization. They will be able to describe various places and locations of Francophonic countries.	1	1	3	-	-	-	-	3	2	-	-			
German-II/ FLS106	CO 1	Students will be able to conjugate the separable verbs.	1	2	3	-	-	-	-	1	1	-	-	-	-	-
	CO 2	Students will be able to write the directions. They will have knowledge of prepositions.	1	2	3	-	-	-	-	2	2	-	-	-	-	-
	CO 3	Students will be able to identify visiting cards vocabulary in the German language.	1	1	2	-	-	-	-	1	2	-	-	-	-	-
	CO4	They will be able to express or/and justify opinions using equivalents of different verbs.	1	3	3	-	-	-	-	2	2	-	-	-	-	-
	CO5	They will know about the capital of Germany Berlin.	1	1	1	-	-	-	-	2	2	-	-	-	-	-

(French-II)/FLS107	CO1	Identify colors, professions and adjectives in French and describing different people and objects using these three.	1	3	2	3	2	2	-	2	2	-	1	-	-	1
	CO2	Lear how to use reflexive verbs to describe daily routine.	1	2	2	3	2	1	-	1	1	-	-	-	-	-
	CO3	Learn Basic vocabulary that can be used to discuss the weather and seasons	1	3	2	3	-	1	-	2	1	-	-	-	1	-
	CO4	Express their likes and dislikes. Also will have understanding of simple conversations in restaurants and how to order food and drinks.	1	3	2	3	-	1	-	2	1	-	-	-	1	2
	CO5	Exchange personal information like name, number, residence, profession, etc	1	3	2	3	-	1	-	1	1	-	-	-	-	1
Community Connect Program (EDO239)	CO1	Become sensitive towards the prevailing socio-economic conditions	3	-	-	-	-	-	-	-	-	3	2			
	CO2	Imbibe the universal values of humanity, love and compassion	3	-	-	-	-	-	-	-	-	3	2			
	CO3	Appreciate interdependence of various components of society	3	-	-	-	-	-	-	1	-	3	2			
	CO4	Contribute to the social welfare by participating in communitybased activities	3	-	-	-	-	-	-	1	-	3	2			
Transition Elements, Coordination Compounds and Chemical Kinetics	CO1	Interpret the properties of d and f block elements and their compounds in terms of their electronic configuration and bonding.	1	2	--	--	--	--	--	--	2	--	--	3	2	--

(CHH312-T)	CO2	Identify the properties of coordination compounds in terms of bonding theories	2	2	--	--	--	--	--	--	2	--	--	3	2	1
	CO3	Develop knowledge on Principles of Chemical Kinetics	--	3	--	--	--	--	--	--	2	--	--	3	2	1
	CO4	Develop knowledge on Principles of Surface Chemistry	1	--	--	--	--	--	--	--	2	--	1	3	2	1
Transition Elements, Coordination Compounds and Chemical	CO1	To familiarize the transition metals and estimating them by gravimetric analysis	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**1**
	CO2	To familiarize the properties of coordination compounds and determine the crystal field	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**1**

Kinetics Lab (CHH312-P)		stabilization energy of metal complexes														
	CO3	To explore the kinetics of a reaction by titrimetric and spectrophotometric methods	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**1**
	CO4	To understand surface chemistry by adsorption, viscosity and partition coefficient experiments	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**1**
Basic Electronics (PHH330-T)	CO1	Recognize a variety of exciting high-tech products, systems and their technology enabled by electronics	1	2	3	3	1	1	1	3	1	2	2	3	1	3

	CO2	Manipulate voltages, currents and resistances in electronic circuits	1	2	3	3	1	1	1	3	1	2	2	3	1	2
	CO3	Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits	1	2	3	3	1	1	1	3	1	2	2	3	1	2
	CO4	Record, analyze and filter audio signals to improve their fidelity.	1	2	3	3	1	1	1	3	3	3	2	3	3	3
Basic Electronics Lab(PHH330-P)	CO1	Demonstrate an ability to conduct investigations of practical/technical issues consistent with their level of knowledge and understanding while designing/performing/resolving the experiments to develop their individual capabilities and representing the collective team work. Demonstrate an ability to analyze data and reach a valid conclusion.		3	3		2		3	3	2	1	3	1	2	

Plant Systematics ,and Angiosperm Phylogeny (EDH301-T)	CO1	Understand the basis, aim and principles of classification of Angiosperms	2	1	3	----	----	----	----	2	2	2	2	3	1	1
	CO2	Understand the salient features of Bentham and Hooker Classification	2	1	3	----	----	----	----	2	2	2	2	3	1	1

	CO3	Understand the diagonistic features, salient vegetative and floral characteristics and economically important plant of various Angiosperm (dicot) families.	2	1	3	----	----	----	----	2	2	2	2	3	1	1
	CO4	Understand the diagonistic features, salient vegetative and floral characteristics and economically important plant of various Angiosperm (monocot) families.	2	1	3	----	----	----	----	2	2	2	3	3	1	1
Plant Systematics ,and Angiosperm Phylogeny Lab (EDH301-P)	CO1	To acquaint students with the technical terms and identification keys for describing and identifying angiosperms.	1	2	3	-	-	1	-	2	2	1	-	3	--	3
	CO2	To familiarize the students with local plants belonging to families included in the study (only those avaiLable during the season).	1	1	2	-	-	-	1	2	2	1	1	3	-	3
	CO3	To enable the students to describe the vegetative and floral characteristics, draw floral diagram and write floral formulae of angiosperms.	1	1	2	--	-	-	-	2	2	-	1	3	-	3
	CO4	To develop the skill of undertaking field study and preparing herbarium sheets.	1	2	2	-	-	-	-	1	2	1	1	1	-	2

Differential Equations (MAH319B)	CO1	explain and solve some standard types of linear differential equations and its applications.	2	3	1	2	----	----	----	1	2	----	2	2	----	----
	CO2	explain and solve the differential equations of 1 st order and 1 st degree and its applications.	2	3	1	2	----	----	----	1	2	----	2	2	----	----
	CO3	explain and solve higher order linear differential equations and simultaneous linear differential equations.	2	3	1	2	----	----	----	1	2	----	2	2	----	----
	CO4	explain and solve some special types of ordinary differential equations.	2	3	1	2	----	----	----	1	2	----	2	2	----	----
	CO5	formulate and solve the linear and non-linear PDE.	2	3	1	2	----	----	----	1	2	----	2	2	----	----
	CO6	solve & analyze the differential equations using OCTAVE.	----	----	----	----	----	----	2	----	----	----	----	----	----	----
Ecology and Animal Behavior (EDH302-T)	CO1	To understand the concept of population dispersal and distribution pattern	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO2	To understand the dynamics of community Diversity	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO3	To understand the dynamics of Ecosystem	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO4	To develop understanding of the animal behaviour	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO5	To understand the evolution of society	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO6	To develop the understanding of biological rhythm	2	1	2	----	3	----	----	2	1	1	1	3	3	3

Ecology and Animal	CO1	To enable students to understand Animal adaptation in different habitats	-	2	3	-	-	2	1	-	-	-	-	1	--	--

Behavior Lab/(EDH302-P)	CO2	To enable students to study Collection and qualitative and quantitative analysis of soil organisms	1	1	2	-	-	-	2	-	-	--	-	1	-	-
	CO3	To enable students to study Estimation of dissolved oxygen, alkalinity and salinity in the pond water	1	-	2	--	-	2	1	-	-	-	-	1	-	-
	CO4	To enable students to study Experiments with maze for studying behavioural motivation	-	2	3			1	2	--	-	-	-	1	-	-
Cell Biology and Genetics EDH303-T	CO1	To understand the structural complexity of a eukaryotic cell	2	1	2	----	3	----	----	2	1	1	1	**3**	**3**	**3**
	CO2	To understand the structure and function of various cell organelles	2	1	2	----	3	----	----	2	1	1	1	**3**	**3**	**3**
	CO3	To get acquainted with the structure and significance of nucleus and chromosomes	2	1	2	----	3	----	----	2	1	1	1	**3**	**3**	**3**
	CO4	To review Mendelian inheritance in the light of gene interactions	2	1	2	----	3	----	----	2	1	1	1	**3**	**3**	**2**
Cell Biology and Genetics Lab (EDH303-P)	CO1	To develop skills of staining cells and observing cell organelles	2	2	3	2	2	2	3	3	2	3	3	**1**	**-**	**2**
	CO2	To prepare temporary and permanent cytological preparations of suitable plant materials to study mitosis and meiosis	3	3	3	2	3	3	3	3	2	3	3	**2**	**2**	
	CO3	To verify Mendelian laws of inheritance	3	2	2	2	3	3	3	3	2	2	2		**1**	**1**

	CO4	To understand the cell structure in details	2	2	3	2	2	2	2	3	2	3	2		**3**	
Education in Contemporary India (EDH214-T)	CO1	Discuss the concept of equality of opportunities in Education considering the constitutional provision.	**3**	2	**3**	-	**1**	-	-	-	-	**2**	**2**	-	**2**	**1**
	CO2	Analyze Indian Constitutional provisions and directive principles	**3**	2	**3**	-	**1**	-	-	-	-	**2**	**2**	-	**2**	**1**
		relevant to Education along with key developments during preindependence era.														
	CO3	Examine the role of NCF 2005, Right to Education Act 2009 and Yashpal committee report in the development of Indian Education system.	**3**	**3**	2	-	-	**3**	-	-	**2**	-	**2**	-	**2**	**1**
	CO4	Explore the core structures of Indian education system and the role of educational agencies in its development.	**2**	2	-	-	-	**2**	-	-	**2**	**2**	**2**	-	**2**	**1**
	CO5	Review the role of teacher in universal and inclusive education in improving the quality in Education.	2	**2**	**2**	**2**	-	**2**	-	-	**2**	**2**	**2**	-	**2**	**1**
Education in Contemporary India Lab (EDH214-P)	CO1	Review of recent articles, editorials, research papers etc. on emerging issues e.g. implementation of RTE/ Equal opportunities for all/ various govt. schemes for universalization of education, girl education/and modernization of education etc.	3	-	3	-	1	-	-	-	-	2	2			

	CO2	Analyze Indian Constitutional provisions and directive principles relevant to Education along with key developments during preindependence era.	3	-	3	-	1	-	-	-	-	2	2			
	CO3	Compare the recommendations of National Curriculum framework 2005 and National Curriculum framework 2022	3	3	-	-	-	3	-	-	2	-	2			
	CO4	Explore the core structures of Indian education system and the role of educational agencies in its development.	2	-	-	-	-	2	-	-	2	2	2			
	CO5	Review the role of teacher in universal and inclusive education	-	2	2	2	-	2	-	-	2	2	2			
		in improving the quality in Education.														
Pedagogy of Biological Science (EDH109-T)	CO1	Understand and appreciate the nature of Science and contributions by eminent Biologists.	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**2**
	CO2	Design learning objectives for content related to Biological Sciences.	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**2**
	CO3	Explain Constructivist approach of building knowledge.	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**2**
	CO4	Apply different pedagogical approaches to design lesson plans.	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**2**
	CO5	Design effective assessment strategies related to Biological Sciences and ICT mediated online assessment sheets.	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**2**

Pedagogy of Biological Science Lab (EDH109-P)	CO1	Understand the Bloom's Taxonomy of Instructional Objectives and design learning objectives for content related to Biological Sciences.	2	2	3	2	2	2	3	3	2	3	3	**2**	**3**	**2**
	CO2	Understand the micro teaching skills and prepare the micro lesson plans for each skill.	3	3	3	2	3	3	3	3	2	3	3	**2**	**3**	**2**
	CO3	Learn about the Herbartian lesson plan and prepare the lesson plans for teaching Biological Science.	3	2	2	2	3	3	3	3	2	2	2	**2**	**3**	**2**
	CO4	Apply different pedagogical approaches to design lesson plans.	2	2	3	2	2	2	2	3	2	3	2	**2**	**3**	**2**
	CO5	Learn about the test construction and construct a test paper for students' assessment.	2	2	3	2	2	2	2	3	1	3	1	**2**	**3**	**2**

Pedagogy of Mathematics (EDH110-T)	CO1	To appreciate the role and contribution of eminent mathematicians.	2	2	3	2	2	2	2	3	2	3	3	2	3	2
	CO2	develop correlation of mathematics with other subjects	2	2	3	2	2	2	2	0	2	3	3	2	3	2
	CO3	To design instructional objectives for chosen content.	2	2	3	2	2	2	2	3	2	3	3	2	3	2
	CO4	Apply innovative methods of teachings to teach mathematics at middle school level.	2	2	3	2	3	2	2	3	2	3	3	2	3	2
	CO5	to Create content appropriate evaluation tools in mathematics.	2	2	3	2	2	2	2	3	2	3	3	2	3	2
	CO6	To reflect the skill set of an effective mathematics teacher in classroom.	3	3	3	2	2	2	2	3	2	3	3	2	3	2

Pedagogy of Mathematics Lab (EDH110-P)	CO1	Develop Lesson Plan incorporating the core components.	2	2	1		2	1		3		3	3	2	3	2
	CO2	Make use of innovative methods of teachings to teach mathematics at middle school level.	2			2	3	2	2		2	1	3	2	3	2
	CO3	Design appropriate evaluation tools for effective evaluation of learning of Mathematical concepts.	2	2	1	2		1	2	3		3	3	2	3	2
	CO4	To demonstrate skill set of an effective Mathematics teacher in the classroom.	1	1	3		2		2			3	3	2	3	2
E-Learning (EDW228)	CO1	Understand concept of elearning and key concepts	1	1	3	1	1	1	1	3	1	1	1	1	1	1
	CO2	Use blended learning approach in e-learning	3	2	2	2	3	3	1	3	1	2	2	1	3	2
	CO3	Use different online tools and resources in assessment	2	3	3	3	3	1	3	1	2	1	2	1	1	1
	CO4	Explore and use the potentialities of Information Communication Technology	2	3	2	3	3	2	3	1	2	2	2	1	3	2

		for colLaborative, constructive &inquiry based learning														
Yoga & Health Education (EDW304)	CO1	Acquire knowledge of theoretical concepts of Yoga and Meditation in relation to holistic health	2	2	3	.....	.....	2	.....	2	2	2	3	1	2	2
	CO2	Apply knowledge of Yogic and meditation-based practices in developing sound physical and mental wellbeing	2	2	3	.....	.....	2	.....	3	2	3	3	1	2	2

	CO3	Develop their personality with a sense of identity and meaning through the practice of Meditation	3	3	3	.....	.....	2	.....	3	2	3	3	1	2	2
	CO4	Build awareness of the importance of Yoga and Meditation in educational context	3	3	3	.....	.....	2	.....	2	2	2	3	1	2	2
Colloquium (EDN 305)	CO1	Identify the contemporary problems existing in society.	2	3	1	------	------	------	------	------	3	2	3	1	3	2
	CO2	Categorize the identified problem and relate it to different research genre.	2	3	1	------	------	------	------	------	3	2	3	1	3	2
	CO3	Analyse the problem by reviewing the concepts.	2	3	1	------	------	------	------	------	3	2	3	1	3	2
	CO4	Suggest best possible solution to the identified problems	3	3	1	------	------	------	------	------	3	3	3	1	3	3
Phase-1 Field Engagement (EDO209)	CO1	Recognise the contribution of psychological, philosophical and socio - economic factors in optimizing teaching and learning	3	----	----	----	----	3	----	3	3	3	3	----	3	3
	CO2	Articulate experiences of observing various components of the particular school set up as part of internship including the	3	3	3	3	3	3	----	3	----	3	3	----	2	2
		aspects of Infrastructure and Human Resources														
	CO3	Present the observations of internship period in a systematic and structured manner in the form of individual and/or Group Tasks	3	3	3	3	3	3	----	3	----	3	3	----	2	2

	CO4	Appreciate importance of school engagement program as a integral component of teacher training programme	3	3	----	----	----	3	----	3	----	3	3	----	3	3
	CO5	Demonstrate an understanding of the differences between government and private school settings and ways of functioning.	3	3	----	3	----	----	----	3	----	3	3	----	2	2
Electrochemistry and Photochemistry (CHH314T)	CO1	Explain the nature of Electrolytic conduction involving theories of electrolytes.	3	3	3	3	-	-	-	-	2	1	-	3	3	3
	CO2	Understand the processes that occur at electrodes and in electrolytes and to apply emf methods to study different types of reactions.	3	3	3	3	-	-	-	-	2	1	-	---------	3	3
	CO3	Describe the basic principles of battery design and understand the chemical reactions used in a lead-acid battery.	3	3	3	3	-	-	-	-	2	1	-	---------	3	3
	CO4	Explain and discuss theories for photoinduced electron transfer and excitation energy transfer, and apply these methods in quantitative calculations	3	3	3	3	-	-	-	-	2	1	-	---------	3	3

Electrochemistry and Photochemistry Lab (CHH314-P)	CO1	Explain the nature of Electrolytic conduction using different electrolytes	3	2	3	3	-	-	-	-	3	1	-	1	1	

	CO2	Understand the calculation of free energy change for an electrochemical cell using the measured cell potential value.	3	2	3	3	-	-	-	-	3	1	-	2	1	1
	CO3	To be able to Measure the cell potential for an electrochemical cell.	3	2	3	3	-	-	-	-	3	1	-		2	1
	CO4	Able to explain theory and practice of common photochemical and photophysical methods, and be able to execute these experimentally	3	2	3	3	-	-	-	-	3	1	-	1	1	2
Relativity and Quantum Mechanics (PHH331-T)	CO1	Discuss and interpret the experiments that reveal the relativistic properties of matter.	2	3	3	3				2	3		1	3	3	1
	CO2	Discuss and interpret the experiments that reveal the wave properties and particle properties of matter.	2	3	3	3				2	3		1	3	3	1
	CO3	Understand the central concepts and principles in quantum mechanics, such as the Schrödinger wave equation, the wave function and their statistical interpretation.	2	3	3	3				2	3		1	3	3	1
	CO4	Understand the basic building blocks of quantum behavior by correlating the classical statistical mechanics and various distributions.	2	3	3	3				2	3		1	3	3	1

	CO5	Demonstrate an ability to conduct investigations of practical/technical issues consistent with their level of knowledge.	2	3	3	3				2	3		1	3	3	1
Relativity and Quantum Mechanics Lab (PHH331-P)	CO1	Demonstrate an ability to conduct investigations of practical/technical issues.	2	3	3	3		2		3	3	2	1	3	1	2
Plant Physiology and Metabolism (EDH310-T)	CO1	Recognise the water relationships of plants and transpiration.	1	2	2	----	----	----	----	3	2	1	1	3	1	1
	CO2	Understand the ascent of sap and transpiration.	1	2	2	----	----	----	----	3	2	2	1	3	1	1
	CO3	Comprehend the process of absorption and mineral nutrition.	1	2	2	----	----	----	----	3	2	2	1	3	1	1
	CO4	Explain the process of photosynthesis and its significance.	1	2	2	----	----	----	----	3	2	2	2	3	1	1
Plant Physiology and Metabolism Lab (EDH310-P)	CO1	To understand the functioning of a plant from the physiological point of view.	2	2	3	2	2	2	3	3	2	3	3		1	1
	CO2	To enable students to handle glassware and equipment for setting up physiology experiments.	3	3	3	2	3	3	3	3	2	3	3		2	1
	CO3	To study responses of plants by manipulating the variables.	3	2	2	2	3	3	3	3	2	2	2		2	1
	CO4	To study the role of N, P, K, Ca, Mg, Fe, N & Zn in plant metabolism.	2	2	3	2	2	2	2	3	2	3	2		2	2

Groups and Rings (MAH320B)	CO1	Recognize the mathematical objects called groups & rings and apply the fundamental concepts of these algebraic structures	2	3	1	2	----	----	2	1	2	----	2	2	----	----
	CO2	Explain the significance of the notions of cosets, normal subgroups, and factor groups and analyze consequences of Lagrange's theorem.	2	3	1	2	----	----	2	1	2	----	2	2	----	----
	CO3	Illustrate structure preserving maps between different algebraic structures & its consequences.	2	3	1	2	----	----	2	1	2	----	2	2	----	----
	CO4	Apply the basic concepts of ring of polynomials and irreducibility tests for polynomials over ring of integers.	2	3	1	2	----	----	2	1	2	----	2	2	----	----
	CO5	Appreciate the significance of unique factorization in rings and integral domains							2							
Complex Analysis & Numerical Analysis (MAH321B-T)	CO1	Demonstrate understanding of the basic concepts underlying complex analysis .			**2**	**3**				**2**	**3**		**1**	**1**	**3**	**1**
	CO2	Apply the methods of complex analysis to evaluate definite integrals and infinite series.	**2**		**2**	**3**				**2**	**3**		**1**	**3**	**3**	**1**
	CO3	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, and the solution of nonlinear equations.			**3**	**2**				**2**	**3**		**1**	**2**	**2**	**1**
	CO4	Apply numerical methods in Real Life problems.			**3**	**3**				**2**	**3**		**1**	**3**	**2**	**1**

	CO5	Solve & analyze the Mathematical problems related to Numerical Analysis and its applications using software.	**1**		**2**	**3**				**2**	**3**		**1**	**2**	**3**	**1**
Complex Analysis & Numerical	CO1	Apply numerical methods in Real Life problems.	2	2	2	2								3		

Analysis Lab (MAH321B-P)																
Developmental Biology and Applied Zoology (EDH311 -T)	CO1	Explain the process of the development, organization and functions of developmental steps in mammals	1	1	2	----	2	----	----	2	2	1	1	3	3	3
	CO2	To conceptualize the concept of the diversity and systemic complexity in neurulation and gastrulation.	1	1	2	----	2	----	----	2	2	1	1	3	3	3
	CO3	Analyze the developmental stages of chick embryo	1	1	2	----	2	----	----	2	2	1	1	3	3	3
	CO4	To have the Knowledge of mechanism of regeneration		1	2	----	2	----	----	2	2	1	1	3	3	3
	CO5	Develop the skill to judicially use beneficial animals for human population	1	1	2	----	2	-	-	2	2	1	1	3	3	3
	CO6	To have the knowledge of harmful animals and critically analyze the IPM	1	1	2	----	2	-	-	2	2	1	1	3	3	3

Developmental Biology and Applied Zoology Lab (EDH311 -P)	CO1	To study the different permanent slides of developmental stages of frog	1	1	2	-	-	3	1	2	-	-	-	3	--	3
	CO2	To study the permanent slides of chick embryos	1	1	2	-	-	-	2	-	2	--	-	3	-	3
	CO3	To Study the common insect pests of stored grains and crops, Study of common nematode pests of crops and Study of common insect vectors.	1	-	2	--	-	1	2	-	2	-	-	3	-	-
	CO4	To Study the economically important	1	1	2			1	2	--	-	3	-	3	-	-
		a) Fishes, b) crustaceans, c) molluscs														
Atomic and Molecular Physics (PHH432 -T)	CO1	Students would be able to understand the basic knowledge of Atomic structure, and its interpretation based on different models.	3	2	2	1	1	1	1	1	2	3	3	1	1	1
	CO2	Students would be able to learn about atomic spectra in presence of magnetic field and electric field. Students would be able to understand different quantum numbers and the selection rules, electronic configuration and L-S coupling.	3	2	2	1	1	1	1	1	2	3	3	1	1	1

	CO3	Students would be able to understand about the molecule structure and associated spectra. Diatomic molecule and associated energy levels will be discussed.	3	2	2	1	1	1	1	1	2	3	3	1	1	1
	CO4	Students would be able to understand the basic concept in electromagnetic theory & Maxwell equations.	3	1	1	2	1	2	3	1	2	2	3	1	1	1
Atomic and Molecular Physics Lab (PHH432 -P)	CO1	Understand of the fundamental concepts used in Optics, and atomic molecular physics.	3	-	-	3	-	3	3	-	-	3	-	-	-	-
	CO2	Analyze and design various conceptual based AMP experiments and verify the fundamental laws.	3	-	-	3	-	3	3	-	-	3	-	-	-	-
	CO3	Identify basic requirements for a design application and propose a cost effective solution.	3	-	-	3	-	3	3	-	-	3	-	-	-	-
	CO4	Find a new cost effective experiments in Atomic and molecular Physics	3	-	-	3	-	3	3	-	-	3	-	-	-	-
Pedagogy of Physical Sciences (EDH128-T)	CO1	To understand the epistemology of science as a school subject in the school curriculum.	1	2	3	3	2	1	1	3	2	1	2	2	1	2

	CO2	To implement various pedagogical approaches to teaching of science at different stages of school.	3	3	3	--	2	2	---	2	1	--	---	1	--	---
	CO3	To plan units and lessons through thematic approach in a holistic manner.	--	--	3	3	3	2	---	3	1	2	---	1	2	---
	CO4	To critically examine teachinglearning process that incorporate enquiry, discovery, activity-based learning, problem solving situations and investigatory projects etc. within the classroom.	---	3	---	2	2	1	2	---	2	--	1	2	--	1
	CO5	To integrate knowledge of science with other school subjects	--	3	2	1	2	1	---	--	3	2		3	2	
	CO6	To integrate knowledge of science in day-to-day life	1	---	1	---	3	---	3	2	2	3	3	2	3	3
Pedagogy of Physical Sciences (EDH128-P)	CO1	Understand the Bloom's Taxonomy of Instructional Objectives and design learning objectives for content related to Physical Science.		2	2	3	2	2	2	3	3	2	3	3	2	1
	CO2	Understand the micro teaching skills and prepare the micro lesson plans for each skill.		3	3	3	2	3	3	3	3	2	3	3	1	--
	CO3	Learn about the Herbartian lesson plan and prepare the lesson plans for teaching Physical Science.		3	2	2	2	3	3	3	3	2	2	2	1	2
	CO4	Apply different pedagogical approaches to design lesson plans.		2	2	3	2	2	2	2	3	2	3	2	2	--

	CO5	Learn about the test construction and construct a test paper for students' assessment.		2	2	3	2	2	2	2	3	1	3	1	3	2
	CO6														2	3
Reading and Reflecting on Texts (EDW 104)	CO1	Explain concept and imporatnce of Reflection through reading especially in context of teaching profession.	2	2	-	3	-	1	-	2	-	-	3	-	-	3
	CO2	Read and respond to a variety of texts in different ways as reader and writer.	2	3	-	2	-	1	-	2	-	-	2	-	-	2
	CO3	Engage in Interactive groups discussions with respect to reading and reflection activities.	2	2	-	2	-	1	-	2	-	-	2	-	-	2
	CO4	Explore different ways of developing reflective and critical thinking in personal and professional spaces.	3	3	-	2	-	1	-	3	-	-	3	-	-	3
Phase-II Field Engagement (EDO314)	CO1	Recognise the contribution of psychological, philosophical and socio - economic factors in optimizing teaching and learning	3	------- -	------- -	------- -	------- -	3	------- -	3	3	3	3			
	CO2	Articulate experiences of observing the teaching of mentor teacher/ teachers and peers	3	------- -	------- -	------- -	------- -	3	------- -	3	3	3	3			
	CO3	Present the observations of internship period in a systematic and structured manner in the	3	------- -	------- -	------- -	------- -	3	------- -	3	3	3	3			

		form of individual and/or Group Tasks														

	CO4	Provide constructive feedback to the peers and accept feedback from them with respect to their teaching	3	3	------ --	------ --	------ --	3	3	------ --	------ --	--------	--------			
	CO5	Appreciate importance of school engagement program as a integral component of teacher training programme	3	3	------ --	------ --	------ --	3	------ --	3	------ --	3	3			
	CO6	Demonstrate an understanding of the differences between government and private school settings and ways of functioning.	3	3	------ --	3	------ --	------ --	------ --	3	------ --	3	3			
Reflective Journal	CO1	Introspect one's strength and weakness during classroom teaching	3	------ --	------ --	------ --	------ --	3	------ --	3	3	3	3	1	-	-
	CO2	Develop a plan of action to channelize one's strength and improve upon the area of concerns	3	------ --	------ --	------ --	------ --	3	------ --	3	3	3	3	1	1	1
	CO3	Envision himself/ herself as an effective prospective teacher	3	------ --	------ --	------ --	------ --	3	------ --	3	3	3	3	2	-	1
	CO4	Imbibe the values essential for becoming the reflective and humane practitioner	3	3	------ --	------ --	------ --	3	3	------ --	------ --	--------	--------	1	2	2
Phase-III School InternshipPedagogy-I	CO1	Prepare mega lesson plan incorporating essential maxims and principles of teaching	1	-	-	2	3	-	1	2	-	-	-	1	2	-
	CO2	Deliver the lesson plan in the classroom demonstrating desired pedagogical skills and competencies	1	3	-	1	3	3	1	2	-	-	-	1	2	-

	CO3	Prepare and utilize the appropriate TLM to facilitate effective teaching	1	1	-	-	3	2	-	1	-	-	-	2	1	-
	CO4	Make appropriate use of tools and techniques for effective evaluation of students learning	1	-	-	-	3	2	-	1	-	-	-	2	1	-
	CO5	Make appropriate use of tools and techniques for effective evaluation of students learning	-	2	3	-	1	1	3	-	-	-	-	1	1	-
	CO6	Utilize peer feedback as a tool to enhance the teaching effectiveness	1	2	-	-	-	-	-	3	-	-	2	1	1	1
Phase-III School InternshipPedagogy-II	CO1	Prepare mega lesson plan incorporating essential maxims and principles of teaching	1	-	-	2	3	-	-	-	-	-	-	1	-	-
	CO2	Deliver the lesson plan in the classroom demonstrating desired pedagogical skills and competencies	1	3	1	1	3	3	-	1	-	-	-	1	-	-
	CO3	Prepare and utilize the appropriate TLM to facilitate effective teaching	1	-	1	-	3	2	-	-	-	1	-	1	1	1
	CO4	Demonstrate effective use of ICT in transacting the curriculum	1	-	1	-	3	2	-	1	-	-	-	1	1	-
	CO5	Make appropriate use of tools and techniques for effective evaluation of students learning	1	2	3	-	-	-	3	-	1	2	-	2	2	-
	CO6	Utilize peer feedback as a tool to	2	-	-	-	-	-	-	3	-	2	2	2	1	1

		enhance the teaching effectiveness														
Action Research	CO1	Identity problems faced during the real classroom situation	2	2	2	-	-	-	-	1	3	-	1	-	-	-
	CO2	Offer tentative solutions for the identified problems	2	2	2	-	-	-	-	1	3	-	1	1	1	-
	CO3	Develop a research based systematic plan of action to solve the problem	2	2	2	-	-	-	-	1	3	-	2	-	1	2
	CO4	Execute and evaluate the effectiveness of the solution	2	2	2	-	-	-	1	1	3	-	1	2	2	-

Case Study	CO1	Execute and evaluate the effectiveness of the solution	3	1	3	-	-	-	1	1	3	1	-	1	-	-
	CO2	Collect relevant information about the case identified	3	1	3	-	-	-	1	1	3	1	-	-	2	_
	CO3	Explore the probable causes for the present conditions of the identified case	3	1	3	-	-	-	1	1	3	1	-	_	-	3
	CO4	Propose a plan of action for the improvement/ restoration of the subject	3	1	3	-	-	-	1	1	3	1	-	_	_	2
Spectroscopy, Natural Products and Heterocycles (CHH315 -T)	CO1	To develop an understanding of basic principles of Spectroscopy and be able to apply the principles in the structural elucidation of simple organic compounds	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**1**	**-**	**2**	**1**	**-**
	CO2	Learn the different types of alkaloids and terpenoids, their chemistry and medicinal importance and be able to apply knowledge of natural compounds	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**1**	**-**	**2**	**1**	**-**

		as lead molecules for new drug discovery.														
	CO3	Describe the chemistry of biomolecules like carbohydrates, lipids, proteins and amino acids	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**1**	**-**	**2**	**1**	**-**
	CO4	Use fundamental polymer chemistry to explain and predict the synthesis of polymers as well as the resultant structure and properties.	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**1**	**-**	**2**	**1**	**-**
	CO5	To understand the chemistry of drugs with respect to their pharmacological activity. To understand the fundamentals of Dyes.	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**1**	**-**	**2**	**1**	**-**
	CO6	To understand the fundamental theoretical understanding of heterocyclic chemistry, including	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**1**	**-**	**2**	**1**	**-**
		alternative general methods for ring synthesis and application of such methods for the preparation of specific groups of heterocyclic systems.														
Spectroscopy, Natural Products and Heterocycles (CHH315 -P)	CO1	Study and understand the working of instrumentation techniques like UV, FTIR and NMR	-	2	3	3	-	-	-	-	3	1	-	2	1	**-**

	CO2	Hands-on-training on the synthesis and structure elucidation of natural products	-	2	3	3	-	-	-	-	3	1	-	2	1	-
	CO3	Synthesis of drug and macromolecules	-	2	3	3	-	-	-	-	3	1	-	2	1	-
	CO4	Experimental understanding of heterocyclic compounds with structure elucidation	-	2	3	3	-	-	-	-	3	1	-	2	1	-
Nuclear and Solid State Physics (PHH433-T)	CO1	Students would be able to describe the nuclear structure on the basis of different nuclear model.	-	-	2	1	2	1	-	1	3	3	1	3	3	2
	CO2	Students would be able to describe radioactive elements and half-life of the elements and familiar with nuclear Reactors/ Detectors	-	-	2	1	2	1	-	1	3	3	1	3	3	2
	CO3	Students would be able to explain and analyze the different crystal structures and different models for thermal properties of solids	-	-	2	1	2	1	-	1	3	3	1	3	3	2
	CO4	Students would be able to determine the electrical, magnetic and superconducting properties of materials	-	-	2	1	2	1	-	1	3	3	1	3	3	2

Nuclear and Solid-State Physics Lab (PHH433-P)	CO1	Students would be able to understand of the fundamental concepts and techniques used in Nuclear Physics.	3	3				3	3	3		3			3	
	CO2	Students would be able to examine the electronic charge and specific charge of electron, i.e. charge mass ratio	3	3				3	3	3		3			3	

	CO3	Students would be able to measure of energy band gap of semi-conductor materials and charge carreir concentrations	3	3				3	3	3		3			3	
	CO4	Students would be able to verify the value of verious Physical constant like Rydburg constant, Planck constant, Hall coeficent etc.	3	3				3	3	3		3			3	
Biochemistry, Plant tissue culture and Biotechnology (EDH410-T)	CO1	understand the structure and functions of biological macromolecules	1	----	2	----	----	----	----	3	3	1	1	3	1	1
	CO2	get acquainted with the techniques, branches and applications of plant tissue culture	1	----	2	----	----	----	----	3	3	2	2	3	2	2
	CO3	get acquainted with the tools and techniques of biotechnology, the processes involving gene manipulation and their applications	1	----	2	----	----	----	----	3	3	2	2	3	2	2
Biochemistry, Plant tissue culture and Biotechnology	CO1	• To understand the molecular mechanisms operating in cells.	1	2	3	-	-	-	-	2	3	1	1	3	--	3

Lab (EDH410-P)																
	CO2	• To familiarize with techniques in biochemistry and biotechnology.	1	1	2	-	-	-	-	2	2	1	1	3	-	3

	CO3	To develop in the students the understanding of biochemical pathways inside an organism	1	1	2	--	-	-	-	2	2	1	1	3	-	3
	CO4	To demonstrate effect of environmental factors such as pH and temperature on various biomolecules.	1	2	3	-	-	-	-	2	2	1	1	3	-	3
Genetics and Paleontology EDH411-T	CO1	To understand the genetic composition of drosophila, Human population and learn method of genetic mapping	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO2	To understand the diversity of human genetic diseases.	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO3	To learn transgenic animal techniques	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO4	To develop the understanding of molecular bases of various genetic diseases	2	1	2	--	3	----	--	2	1	1	1	3	3	3
	CO5	To develop the understanding of Palentology	2	1	2	---	3	----	--	2	1	1	1	3	3	3
	CO6	To understand Zoogeography	2	1	2	---	3	----	--	2	1	1	1	3	3	3
Genetics and Paleontology Lab EDH411 -P	CO1	To identify and study drosophila	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO2	To identify blood groups and Rh factor in man	2	1	2	----	3	----	----	2	1	1	1	3	3	3
	CO3	To study various fossils models and living fossils	2	1	2	----	3	----	----	2	1	1	1	3	3	3

Linear Algebra (MAH401B)	CO1	Interpret vector space and its properties along with examples and solve the related problems	2	3	1	2			3	1	2		1	2		
	CO2	Distinguish between nonlinear and linear transformations on vector spaces and their properties	2	3	1	2			3	1	2		1	2		
	CO3	Apply the concept of Eigen values, Eigen vectors and Eigen spaces in real life application	2	3	1	2			3	1	2		1	2		
	CO4	Analyze and solve the problems on bilinear and quadratic forms	2	3	1	2			3	1	2		1	2		
	CO5	implement the concept of inner product space and its properties along with examples and solve the related problems	2	3	1	2			3	1	2		1	2		
	CO6	analyze the Mathematical problems using OCTAVE software.						3								
Molecular Biology and Immunology EDH402 -T	CO1	To Understand the development, organizatio,n and functions of genes	1	----	2	----	----	----	----	1	2	1	1	3	1	1
	CO2	To develop understanding of transcription and translation	1	----	2	----	----	----	----	1	2	1	1	3	3	3
	CO3	To develop an understanding of techniques of immunology	1	----	2	----	----	----	----	1	2	1	1	3	3	3
	CO4	To develop the skills required for designing the immune techniques	1		2		2			1	2	1	1	3	3	3
	CO5	To analyze and apply third generation vaccine	1	1	2		2			1	2	1	1	3	3	3

	CO6	To analyze and apply skills and tools to design the drugs against cancer	1	1	2		2			1	2	1	1	3	3	3

Molecular biology and Immunology Lab (EDH402 -P)	CO1	To study the staining of Mitochondria	1	1	2	1	----	2	----	1	2	1	1	3	1	3
	CO2	Study of slides of grasshopper	1	1	2	1--	----	----	----	1	2	1	1	3	1	3
	CO3	study of Karyotype of man	1	1	2	----	----	----	----	1	2	1	1	3	1	3
	CO4	Study of antigen antibody reaction	1	1	2		2			1	2	1	1	3	1	3
SEMINAR (EDN412)	CO1	To enable interest in a theme and structure thoughts for a presentation.	**1**	**1**	**2**	1	1	----	1	**3**	**3**	**3**	**1**	**3**	**3**	**3**
	CO2	To understand annotated bibliography with an outline that demonstrates scholastic abilities	**----**	**---**	**2**	---	---	----	1	**3**	**3**	**3**	**----**	**3**	**3**	**3**
	CO3	To develop analysis and understanding of conceptual data.	**1**	**1**	**2**	1	1	----	1	**3**	**3**	**3**	**1**	**3**	**3**	**3**
	CO4	To develop soft skills and employ cutting-edge technology to create proposal reports, such as Trello, Zootero, Jasper ai, and Ref-nwrite	**----**	**---**	**2**	---	---	----	1	**3**	**3**	**3**	**----**	**3**	**3**	**3**
School Leadership and Management (EDH236)	CO1	understand key leadership theories and ideas, from inside and outside education, and apply these to thinking about their own practice	2	-	2	-	-	3	--	3	-	-	3	**3**		**3**

	CO2	draw on evidence from research and practice to develop knowledge with an understanding of what is known about effective leadership	2	-	-	-	-	3	--	3	-	-	3	**3**		**3**
	CO3	relate these to their own leadership context in planning actions	3	-	-	-	-	3	--	3	-	-	3	**3**		**3**
	CO4	undertake practice-based tasks enabling self-evaluation of their leadership in action	3	-	3	-	-	3	--	3	-	-	3	**3**		**3**
	CO5	develop their reflective practice skills to help them to evaluate and improve their own leadership practice	3	-	3	-	-	3	--	3	2	-	3	**3**		**3**
	CO6	learn colLaboratively, supported by a mentor, to share insights, and develop knowledge and skills.	3	-	3	-	-	3	--	3	-	-	3	**3**		**3**
Educational leadership (MOOC-210-EDS-402)	CO1	understand key leadership theories and ideas, from inside and outside education, and apply these to thinking about their own practice	2	2	2	-	-	3	--	3	-	-	-	3	--	3
	CO2	draw on evidence from research and practice to develop knowledge with an understanding of what is known about effective leadership	2	2	-	-	-	3	--	3	-	-	-	3	--	3
	CO3	relate these to their own leadership context in planning actions	3	3	-	-	-	3	--	3	-	-	-	3	--	3

	CO4	undertake practice-based tasks enabling self-evaluation of their leadership in action	3	3	3	-	-	3	--	3	-	-	-	3	--	3
Peace and Value Education (EDS 220)	CO1	Assimilate the concept of Self Identity	2	2	---	2	2	2	-----	1	2	2	2	2	2	2
	CO2	Reflect on the factors which influence ones self Identity	----	3	---	2	3	2	---	1	2	2	2	2	2	2
	CO3	Analyse the factors which positively enhance one's professional Identity	1	2	1	1	1	2	2	1	2	2	2	2	2	2
	CO4	Appreciate the teaches role as a facilitator to build students self identity and professional identity	2	2	3	2	3	2	1	1	2	2	2	2	2	2
	CO5	showcase qualities of teacher as a reflective practioner	2	2	2	1	1	2	1	1	2		2	2		2
Guidance and Counselling EDS221	CO1	The students will apply the knowledge of guidance and counselling in real life situations	3	3	3	-	-	-	2	2	2	2	2	2	2	2
	CO2	The student will imbibe and demonstrate qualities of an effective counsellor	3	3	2	-	-	-	3	3	1	2	2	1	2	2
	CO3	The student will demonstrate various approaches of guidance and counselling	2	2	2	-	-	-	2	2	2	1	2	2	1	2
	CO4	The student will effectively use tools for testing and evaluating different techniques for assessment	1	1	1	-	-	-	2	3	1	1	2	1	1	2

Human Rights in Education (EDS 222)	CO1	Reflect on the factors which influence ones self Identity	----	3	---	2	3	2	---	1	2	2	2	2	2	2
	CO2	Analyse the factors which positively enhance one's professional Identity	1	2	1	1	1	2	2	1	2	2	2	1	2	2
	CO3	Appreciate the teaches role as a facilitator to build students self identity and professional identity	2	2	3	2	3	2	1	1	2	2	2	2	1	2
Environment and Education (EDS 223)	CO1	Understand and explain the multidisciplinary dimensions of environmental issues.	2	2	1	1		2	2	2	2	----	----	2	2	1
	CO2	Understand the primary environmental problelms and and suggest potential solutions	2	2	2	3		2	2	1	2	----	----	2	2	1
	CO3	understand and explain about the various groups of plants and animals and their interaction with various ecosystem	2	2	2	1		3	2	2	1	----	----	2	2	2
	CO4	Appreciate the principles governing the interactions between social and environmental factors	1	1	2	2		2	2	1	2	----	----	2	2	2