Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

FACULTY OF SCIENCE & HUMANITIES

DEPARTMENT OF SCIENCE & HUMANITIES

SCHEME & SYLLABUS BOOKLET

BATCH 2022-2025

SCHEME

&

SYLLABUS

BATCH: 2022-25

INDEX

Disclaimer: The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

Student Details

Name of Student:

Name of Program:

Semester: Year: Batch:

Faculty of:

Your Dreams Our Goal

POORNIMA UNIVERSITY

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VISION

To create knowledge based society with scientific temper, team spirit and dignityof labor to face global competitive challenges.

Mission

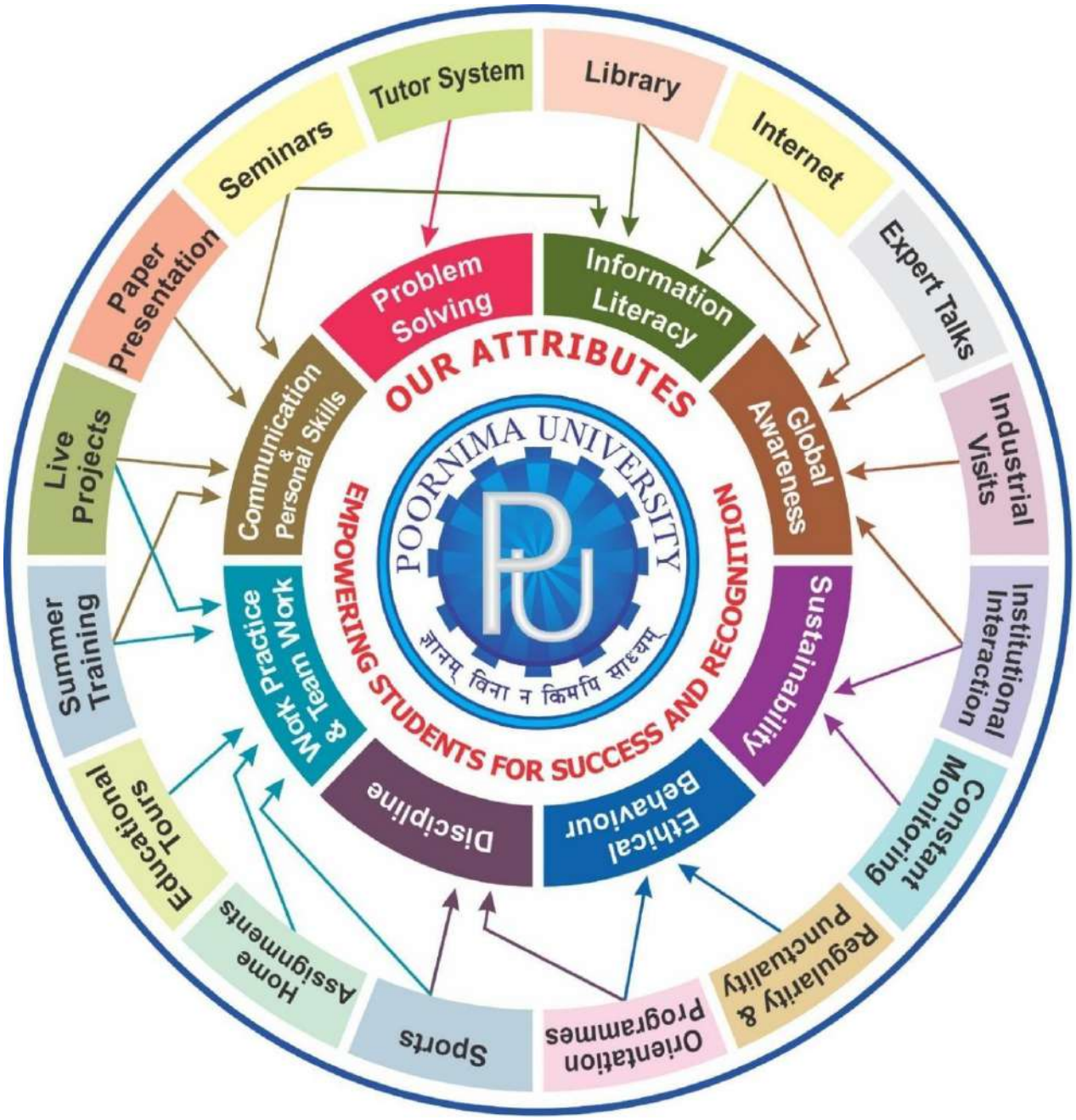
To evolve and develop skill based systems for effective delivery of knowledge soas to equip young professionals with dedication and commitment to excellence inall spheres of life.

Quality Policy

To provide Quality Education through Faculty development, updating of facilitiesand continual improvement meeting University norms and keeping stake holderssatisfied.

Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as wellas soft skills and traditional systems of learning processes.



About Program and Program Outcomes (PO):

Title of the Programme: Bachelor of Science (B. Sc.)

Nature of the Programme: B. Sc. is three year full-time programme.

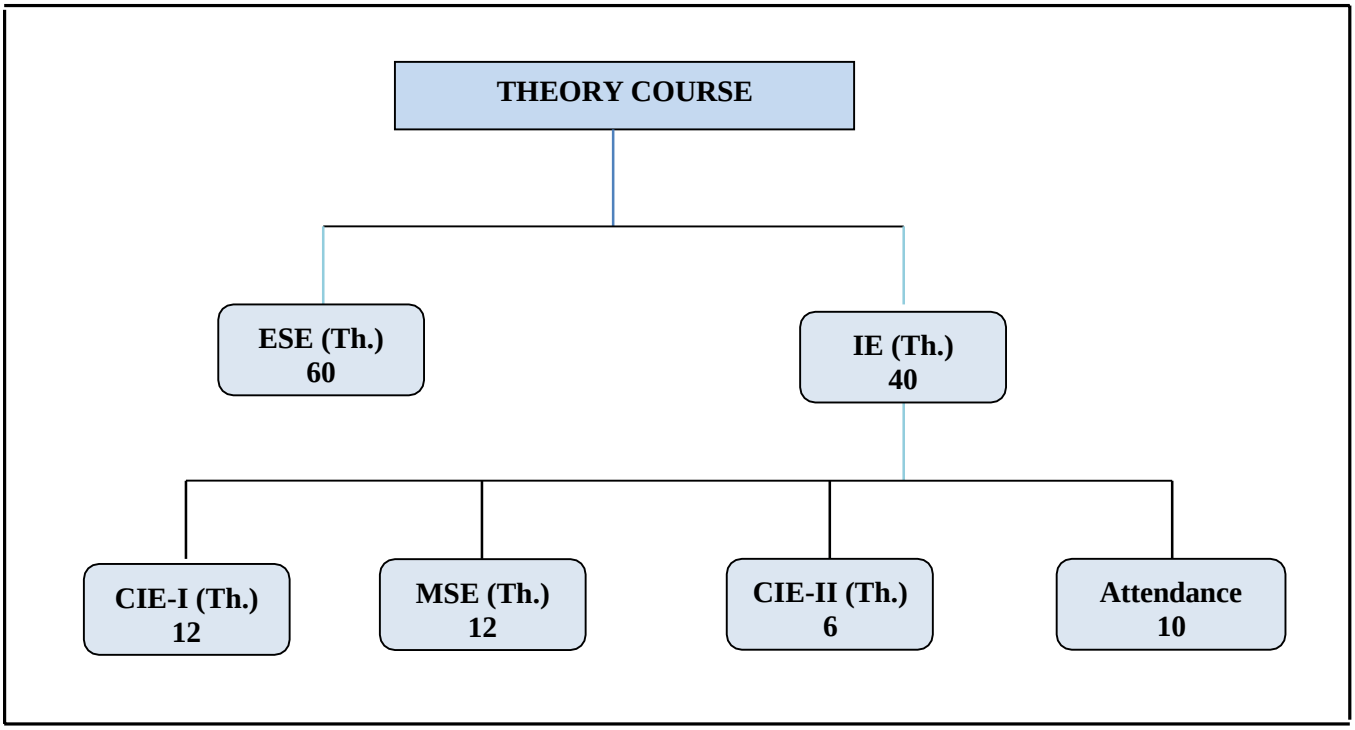
Program Outcomes (PO):

Science Graduates will be able to:

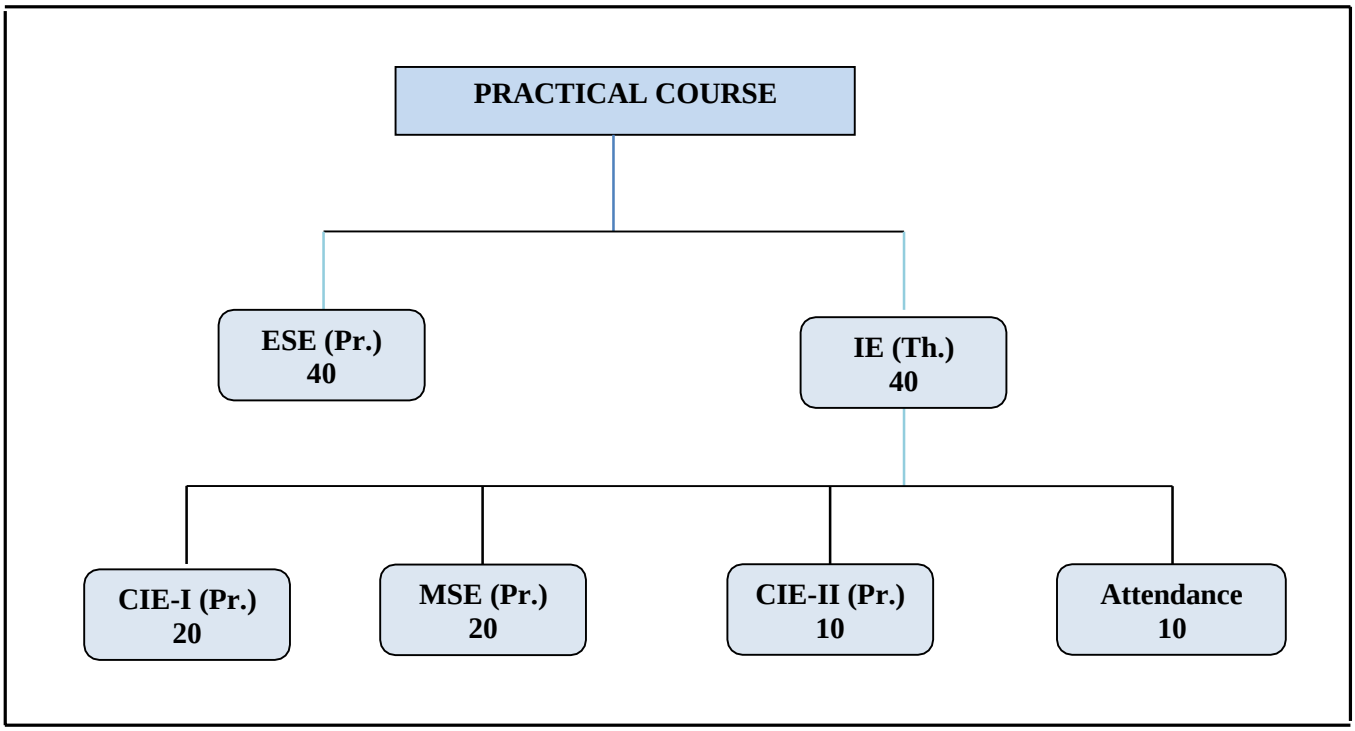
1. **Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of B.Sc. program.
2. **Scientific reasoning and Problem solving:** Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences Capacity to extrapolate from what one has learned and apply their competencies to solve real life situations
3. **Analytical reasoning and Research related skills:** Define problems, formulate hypotheses, test, analyze, interpret and draw conclusions from data and report the results of an experiment or investigation
4. **Critical thinking:** identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
5. **Digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
6. **Reflective thinking:** Possess knowledge of Critical sensibility to lived experiences, with self-awareness and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.
7. **Environment and sustainability: A**ppreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.
8. **Moral and ethical awareness:** Ability to embrace ethical values in conducting one's life, formulates a position about an ethical issue from multiple perspectives, and use ethical practices in all work.
9. **Leadership qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction to work effectively and respectfully with diverse teams; and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
10. **Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; present complex information in a clear and concise manner.
11. **Project management and finance**: Ability to work independently, identify appropriate resources required for a project, and manage a project.
12. **Lifelong learning:** Ability to acquire knowledge and skills in learning activities throughout life aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place.

Examination System:

A. Marks Distribution of Theory Course:



B. Marks Distribution of Practical Course :



Th. : Theory, **Pr.** : Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

Marks Distribution of Attendance:

Guidelines for Marks Distribution of Attendance Component		
S No.	**Total Course Attendance (TCA) range in Percentage**	**Marks allotted (out of 10)**
1	95% ≤ TCA	10
2	90% ≤ TCA < 95%	9
3	85% ≤ TCA < 90%	8
4	80% ≤ TCA < 85%	7
5	70% ≤ TCA < 80%	6
6	60% ≤ TCA < 70%	5
7	50% ≤ TCA < 60%	4
8	40% ≤ TCA < 50%	3
9	30% ≤ TCA < 40%	2
10	20% ≤ TCA < 30%	1
11	TCA < 20%	0

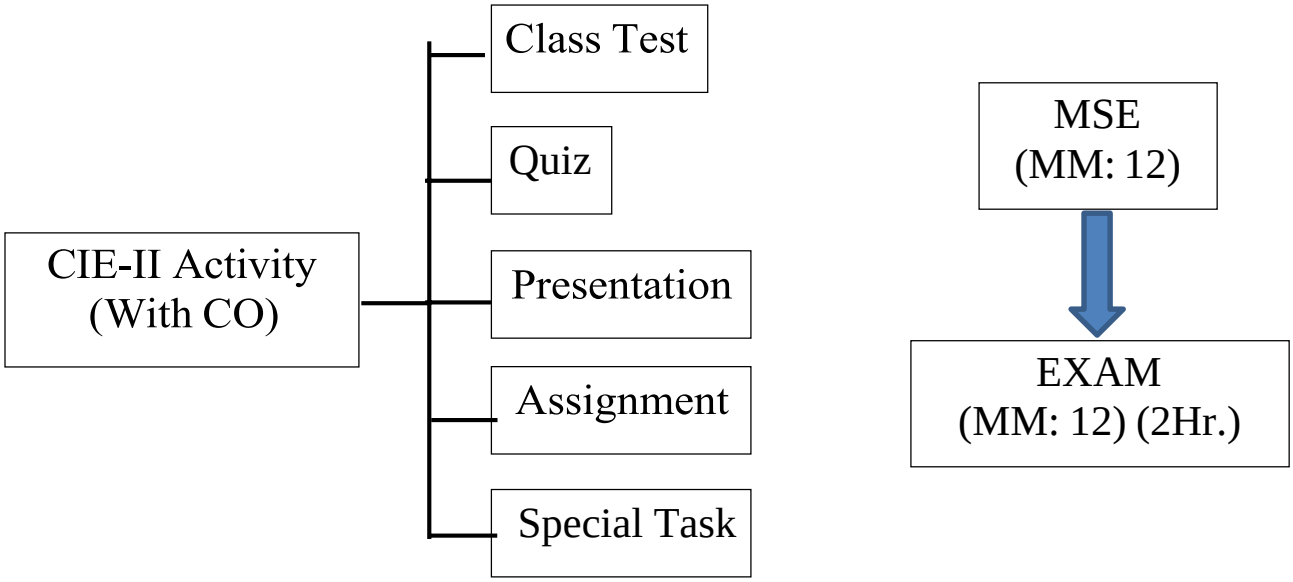
CO Wise Marks Distribution:

	Theory Subject		**Practical/ Studio Subject**	
	Maximum Marks	**CO to be Covered**	**CO to be Covered**	**Maximum Marks**
CIE-I (Class Test)	12 (6 + 6)	1 & 2	1 & 2	20 (10 + 10)
MSE	12 (6 + 6)	3 & 4	3 & 4	20 (10 + 10)
CIE-II (Activity/ Assignment)	6 (6)	5	5	10 (10)
Attendance	10	-	-	10
ESE	60	-	-	40
TOTAL	100	-	-	100

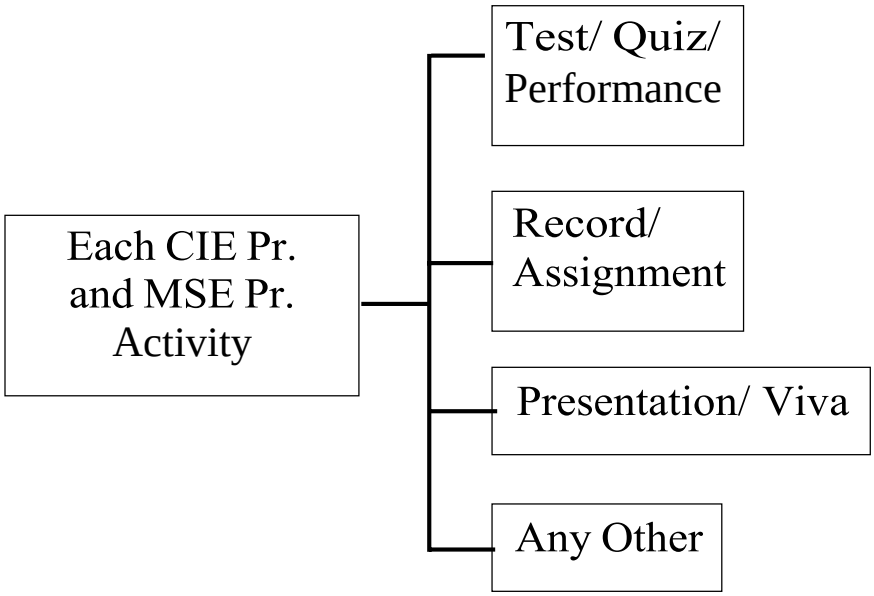
Minimum Passing Percentage in All Exams:

S. No.	Program	Minimum Passing Percentage in All Exam	
		ESE Component	Total Component
1	Course Work for Ph. D Registration	----------	**50 %**
2	B. Arch.	45 %	**50 %**
3	MBA, MHA, MPH, MCA, M. Tech., M. Plan. and M. Des.	40 %	40 %
4	B. Tech., B. Des., BCA, B.Sc., BVA, B. Voc., BBA, B.Com., B.A. and Diploma	35 %	40 %
5	B. Sc. (Hospitality & Hotel Administration)	35 %	40 % (Theory) & 50 % (Practical)

Break-up of Internal Exam (Theory):



Break-up of Internal Exam (Practical):



Assessment & Grade Point Average: SGPA, CGPA:

SGPA Calculation

$$\textbf{SGPA} = \frac{C_1G_1+C_2G_2+\cdots\ldots\ldots\ldots\ldots C_nG_n}{C_1+C_2+\cdots\ldots\ldots\ldots\ldots\ldots C_n}$$

$\textbf{SGPA} = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$	Where (as per teaching Scheme & Syllabus) : C_i is the number of Credits of Courses i, G_i is the Grade Point for the Course i and i = 1, 2…….n n = number of courses in a programme in the Semester

CGPA Calculation

$$\textbf{CGPA} = \frac{C_1G_1+C_2G_2+\cdots\ldots\ldots\ldots\ldots C_nG_n}{C_1+C_2+\cdots\ldots\ldots\ldots\ldots\ldots C_n}$$

$\textbf{CGPA} = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$	Where (as per teaching Scheme & Syllabus) : C_i is the number of Credits of Courses i, G_i is the Grade Point for the Course i and i = 1, 2…….n n = number of courses in a programme of all the Semester up to which CGPA is computed.

Grading Table:

Grading Table-A: For B.Arch. and course work for Ph.D. Registration

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	A+	10	$90 \leq x \leq 100$
Excellent	A	9	$80 \leq x < 90$
Very good	B+	8	$70 \leq x < 80$
Good	B	7	$60 \leq x < 70$
Average	C	6	$50 \leq x < 60$
Fail	F	0	$x<50$

Grading Table-B: For all courses except B.Arch. and course work for Ph.D. Registration

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	A+	10	$90 \leq x \leq 100$
Excellent	A	9	$80 \leq x < 90$
Very good	B+	8	$70 \leq x < 80$
Good	B	7	$60 \leq x < 70$
Average	C	6	$50 \leq x < 60$
Satisfactory	D	5	$40 \leq x < 50$
Fail	F	0	$x<40$

Calculation of SGPA

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

Calculation of CGPA

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

where (as per teaching scheme & syllabus): C_i is the number of credits of subject i,
G_i is the Grade Point for the subject I and i = 1 to n, n = number of subjects in a course in the semester

Award of Class:

CGPA	Equivalent Division
7.50 ≤ CGPA	First Division with Distinction
6.50 ≤ CGPA < 7.50	First Division
5.50 ≤ CGPA < 6.50	Second Division
4.50 ≤ CGPA < 5.50	Pass Class

The multiplication factor for conversion of CGPA to percentage is Equivalent % of Marks = (CGPA-0.5) x 10.

For Example if CGPA = 5.5 then % is (5.5-0.5) x 10 = 50%.

Guidelines for MOOC COURSES:

1. Applicable from the session 2020 – 21 onwords, for students aspiring for HONOURS Degree.

2. The UGC has issued UGC (Credit Framework for Online Learning Courses) Regulation, 2016. These shall apply to all universities established or incorporated by or under a Central Act, a Provincial Act, or a State/Union Territory Act and all institutions recognized by or affiliated to such Universities and all institutions deemed to be universities under Section 3 of the UGC Act, 1956.

3. All India Council for Technical Education (AICTE) has introduced Model Curriculum for Bachelor programs of 4 years/ 3 Years, and additional credits will be required to be done for the degree of Bachelor program with Honours. These additional credits will have to be acquired with online courses (MOOCs) as per AICTE.

4. This creates an excellent opportunity for students to acquire the necessary skill set for employability through massive online courses where the rare expertise of world famous experts from academics and industry are available.

5. Students are required to complete additional credits through MOOCs within 4 years/ 3years of time (whatever be applicable time for the completion of registered program) so as to become eligible for Honours degree as per norms.

6. It is necessary to complete minimum MOOCs credit course as mentioned below for becoming eligible for the Honours degree in the registered program.

7. MOOC Course Credits shall be calculated as per details given below:

8. Student are required to give the prior information about MOOCs courses to his respective HOD and COE, in which he/she wants to register for online certification.

9. After getting permission from respective HOD, a student can register for the MOOC certification courses.

10. After successful completion of the said MOOC course, the student shall submit the certificate of completion to the respective department. If he/ she fails to provide the certificates of MOOC courses before last teaching day of the semester then these certificates will not be considered later.

Required credits for Honours :

S.No	Program Duration	Required credits for Honours
1.	2- Year	10- Credits
2.	3- Year	15- Credits
3.	4-Year	20- Credits

S. No	NPTEL/ SWAYAM Course duration (in weeks)	Equivalent Credits
1	4	2
2	8	3
3	12	4

Attached Items:

Open Elective Booklet	Annexure-1
Soft Skills Booklet	Annexure-2
Value Added Course Booklet	Annexure-3

POORNIMA UNIVERSITY								
Faculty of Science & Humanities								
Name of Program: B.Sc. (ECC), Batch: 2022-25								
Teaching Scheme for First Year, First Semester								
Course Code	Course Name	Teaching Scheme (Hrs per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P)	IE	ESE	Total	
A.	University Core Courses							
A.1	Theory							
BULCSA1101	Environmental Studies	2	-	-	40	60	100	2
A.2	Practical							
	Nil	-	-	-	-	-	-	-
B.	Department Core Courses							
B.1	Theory							
BESCES1101	Fundamentals of Environmental Science	3	-	-	40	60	100	3
BESCES1102	Environmental Ecology & Ecosystem Dynamics:	3	-	-	40	60	100	3
BESCES1103	Inorganic Chemistry	3	-	-	40	60	100	3
BESCES1104	Organic Chemistry	3	-	-	40	60	100	3
BESCES1105	Operating Systems	3	-	-	40	60	100	3
BESCES1106	Computer Fundamentals & C Programming	3	-	-	40	60	100	3
B.2	Practical							
BESCES1201	Environmental Science Lab-I	-	-	2	60	40	100	1
BESCES1202	Chemistry Lab-I	-	-	2	60	40	100	1
BESCES1203	C Programming Lab-I	-	-	2	60	40	100	1
C.	Department Elective: Anyone One							
	NIL	-	-	-	-	-	-	-
D.	Open Elective: Anyone							
	NIL	-	-	-	-	-	-	-
E.	Humanities and Social Sciences including Management courses OR Ability Enhancement Compulsory Course (AECC)							
BULCHU1201	Foundation English	-	-	2	60	40	100	1
F.	Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere							
	NIL	-	-	-	-	-	-	-
G.	Discipline, Value Added Courses & Social Outreach							
BESCES1601	Discipline, Value Added Courses & Social Outreach Talent Enrichment Programme (TEP-I) Library / MOOC / Online Certification Courses	-	-	-	50	-	50	1
	Total	20		8				25
	Total Teaching Hours	28						

POORNIMA UNIVERSITY								
Faculty of Science & Humanities								
Name of Program: B.Sc. (ECC), Batch: 2022-25								
Teaching Scheme for First Year , Second Semester								
Course Code	Course Name	Teaching Scheme (Hrs per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P)	IE	ESE	Total	
A.	University Core Courses							
A.1	Theory							
	Nil	-	-	-	-	-	-	-
A.2	Practical							
	Nil	-	-	-	-	-	-	-
B.	Department Core Courses							
B.1	Theory							
BESCES2101	Environmental Microbiology	3	-	-	40	60	100	3
BESCES2102	Natural Resource Conservation	3	-	-	40	60	100	3
BESCES2103	Organic Chemistry	3	-	-	40	60	100	3
BESCES2104	Physical Chemistry	3	-	-	40	60	100	3
BESCES2105	Data Structure	3	-	-	40	60	100	3
BESCES2106	Computer Networks	3	-	-	40	60	100	3
B.2	Practical							
BESCES2201	Environmental Science Lab-II	-	-	2	60	40	100	1
BESCES2202	Chemistry Lab-II	-	-	2	60	40	100	1
BESCES2203	Data Structure Lab-II	-	-	2	60	40	100	1
C.	Department Elective: Any One							
	NIL	-	-	-	-	-	-	-
D.	Open Elective: Anyone							
	As per Annexure	2	-	-	40	60	100	2
E.	Humanities and Social Sciences including Management courses OR Ability Enhancement Compulsory Course (AECC)							
BULCHU2201	Human Values & Professional Ethics	-	-	2	60	40	100	1
F.	Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere							
	NIL	-	-	--	-	-	-	-
G.	Social Outreach, Discipline, TEP, VAC & Extra-Curricular Activities							
BESCES2601	Discipline, Value Added Courses & Social Outreach Talent Enrichment Programme (TEP-II) Library / MOOC / Online Certification Courses	-	-	-	50	-	50	1
	Total	20		8				
	Total Teaching Hours	28						25

POORNIMA UNIVERSITY								
Faculty of Science & Humanities								
Name of Program: B.Sc. (ECC), Batch: 2022-25								
Teaching Scheme for Second Year, Third Semester								
Course Code	Course Name	Teaching Scheme (Hrs per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P)	IE	ESE	Total	
A.	University Core Courses							
A.1	Theory							
	NIL	-	-	-	-	-	-	-
A.2	Practical							
	Nil	-	-	-	-	-	-	-
B.	Department Core Courses							
B.1	Theory							
BESCES3101	Environmental Pollution and Control-I	3	-	-	40	60	100	3
BESCES3102	Inorganic Chemistry	3	-	-	40	60	100	3
BESCES3103	Physical Chemistry	3	-	-	40	60	100	3
BESCES3104	Web Development	3	-	-	40	60	100	3
B.2	Practical							
BESCES3201	Environmental Science Lab-III	-	-	2	60	40	100	1
BESCES3202	Chemistry Lab-III	-	-	2	60	40	100	1
BESCES3203	Web Development Lab-III	-	-	2	60	40	100	1
C.	Department Elective: Any One							
BESEES3101	Biodiversity and Wildlife	3	-	-	40	60	100	3
BESEES3102	Environment Management				40	60	100	
-D.	Open Elective: Anyone							
	As per Annexure	2	-	-	40	60	100	2
E.	Humanities and Social Sciences including Management courses OR Ability Enhancement Compulsory Course (AECC)							
BULCHU3201	Communication Skills -I	-	-	2	60	40	100	1
F.	Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere							
	NIL							
G.	Social Outreach, Discipline, TEP, VAC & Extra-Curricular Activities							
BESCES3601	Discipline, Value Added Courses & Social Outreach Talent Enrichment Programme (TEP-III) Library / MOOC / Online Certification Courses	-	-	-	50	-	50	1
	Total	17		8				
	Total Teaching Hours	25						22

POORNIMA UNIVERSITY								
Faculty of Science & Humanities								
Name of Program: B.Sc. (ECC), Batch: 2022-25								
Teaching Scheme for Second Year Fourth Semester								
Course Code	Course Name	Teaching Scheme(Hrs per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P)	IE	ESE	Total	
A.	University Core Courses							
A.1	Theory							
	Nil	-	-	-	-	-	-	-
A.2	Practical							
	Nil	-	-	-	-	-	-	-
B.	Department Core Courses							
B.1	Theory							
BESCES4101	Environmental Pollution and Control-II	3	-	-	40	60	100	3
BESCES4102	Inorganic Chemistry	3	-	-	40	60	100	3
BESCES4103	Organic Chemistry	3	-	-	40	60	100	3
BESCES4104	Database Management Systems	3	-	-	40	60	100	3
B.2	Practical							
BESCES4201	Environmental Science Lab-IV	-	-	2	60	40	100	1
BESCES4202	Chemistry Lab-IV	-	-	2	60	40	100	1
BESCES4203	DBMS Lab-IV	-	-	2	60	40	100	1
C.	Department Elective: Anyone							
BESEES4101	Software Engineering	3	-	-	40	60	100	3
BESEES4102	Renewable and Alternate Energy				40	60	100	
D.	Open Elective: Anyone							
	As per Annexure	2	-	-	40	60	100	2
E.	Humanities and Social Sciences including Management courses OR Ability Enhancement Compulsory Course (AECC)							
BULCHU4201	Communication Skills -II	-	-	2	60	40	100	1
F.	Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere							
BESCES4401	Technical Seminar	-	-	2	40	60	100	1
G.	Discipline, Value Added Courses & Social Outreach							
BSACSA4601	Discipline, Value Added Courses & Social Outreach							
	Talent Enrichment Programme (TEP-IV)	-	-	-	50	-	50	1
	Library / MOOC / Online Certification Courses							
	Total	17		10				
	Total Teaching Hours	27						23

POORNIMA UNIVERSITY								
Faculty of Science & Humanities								
Name of Program: B.Sc. (ECC), Batch: 2022-25								
Teaching Scheme for Third Year, Fifth Semester								
Course Code	**Course Name**	**Teaching Scheme (Hrs per Week)**			**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorials (T)**	**Practical (P)**	**IE**	**ESE**	**Total**	
A.	**University Core Courses**							
A.1	**Theory**							
	Nil	-	-	-	-	-	-	-
A.2	**Practical**							
	Nil	-	-	-	-	-	-	-
B.	**Department Core Courses**							
B.1	**Theory**							
BESCES5101	**Environmental Impact Assessment**	3	-	-	40	60	100	3
BESCES5102	**Disaster Management**	3	-	-	40	60	100	3
BESCES5103	**Organic Chemistry**	3	-	-	40	60	100	3
BESCES5104	**OOPS Using Java**	3	-	-	40	60	100	3
B.2	**Practical**							
BESCES5201	**Environmental Science Lab-V**	-	-	2	60	40	100	1
BESCES5202	**Chemistry Lab-V**	-	-	2	60	40	100	1
BESCES5203	**Java Programming Lab-V**	-	-	2	60	40	100	1
C.	**Department Elective: Anyone**							
BESEES5101	**Fundamentals of Cloud Computing**	3	-	-	40	60	100	3
BESEES5102	**Data Structure**				40	60	100	
D.	**Open Elective: Anyone**							
	As per Annexure	2	-	-	40	60	100	2
E.	**Humanities and Social Sciences including Management courses OR Ability Enhancement Compulsory Course (AECC)**							
BULCHU5201	**Professional Skills -I**	-	-	2	60	40	100	1
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere**							
BESCES5401	**Industrial Training & Seminar**	-	-	2	60	40	100	6
G.	**Social Outreach, Discipline, TEP, VAC & Extra-Curricular Activities**							
BESCES5601	**Discipline, Value Added Courses & Social Outreach**	-	-	-	50	-	50	1
	Talent Enrichment Programme (TEP-V)							
	Library / MOOC / Online Certification Courses							
	Total	17		10				28
	Total Teaching Hours	27						

POORNIMA UNIVERSITY								
Faculty of Science & Humanities								
Name of Program: B.Sc. (ECC), Batch: 2022-25								
Teaching Scheme for Third Year Sixth Semester								
Course Code	Course Name	Teaching Scheme (Hrs per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P	IE	ESE	Total	
A.	University Core Courses							
A.1	Theory							
	NIL	-	-	-	-	-	-	-
A.2	Practical							
	NIL	-	-	-	-	-	-	-
B.	Department Core Courses							
B.1	Theory							
BESCES6101	Environmental Legislation & Contemporary Environmental Issues	3	-	-	40	60	100	3
BESCES6102	Physical Chemistry	3	-	-	40	60	100	3
BESCES6103	Python Programming	3	-	-	40	60	100	3
B.2	Practical							
	NIL	-	-	-	-	-	-	-
C.	Department Elective: Anyone							
	NIL	-	-	-	-	-	-	-
D.	Open Elective: Anyone							
	NIL	-	-	-	-	-	-	-
E.	Humanities and Social Sciences including Management coursesOR Ability Enhancement Compulsory Course (AECC)							
BULCHU6201	Professional Skills -II	-	-	2	60	40	100	1
F.	Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere							
BSACSA6401	Dissertation	-	-	14	60	40	100	8
G.	Social Outreach, Discipline, TEP, VAC & Extra-Curricular Activities							
BESCES6601	Discipline, Value Added Courses & Social Outreach							
	Talent Enrichment Programme (TEP-VI)	-	-	-	50	-	50	1
	Library / MOOC / Online Certification Courses							
	Total	9		16				19
	Total Teaching Hours	25						

CORE Theory Subject

Code: BULCSA1101 ENVIRONMENTAL STUDIES 2.0 Credits [LTP: 2-0-0]

COURSEOUTCOMES:

Students would be able to:

CO1: Understand the scope of environmental studies and explain the concept of ecology, ecosystem and biodiversity.

CO2: Implement innovative ideas of controlling different categories of Environmental Pollution.

CO3: Explain different environmental issues together with various Environmental Acts, regulations and International Agreements.

CO4: Summarize social issues related to population, resettlement and rehabilitation of project affected persons and demonstrate disaster management with special reference to floods, earthquakes, cyclones, landslides.

CO5: Determine the local environmental assets with simple ecosystems and identify local flora and fauna.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Environmental Studies	**5**
2.	Environmental Pollution and its Control	**5**
3.	Environmental Policies & Practices	**5**
4.	Human Communities and the Environment	**5**
5.	Field Work	**4**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Environmental Studies**
	• Introduction of Unit • Multidisciplinary nature of environmental studies Concept of sustainability and sustainable development. • Ecosystem: Structure and function of ecosystem • Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies\ • Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem • Aquatic ecosystems • Biodiversity and Conservation • Conclusion & Real Life Application
2.	**Environmental Pollution and its Control**
	• Introduction of Unit • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies • Conclusion & Real Life Application
3.	**Environmental Policies & Practices**

	• Introduction of Unit • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. • International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD) • Conclusion & Real Life Application
4.	**Human Communities and the Environment**
	• Introduction of Unit • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Conclusion & Real Life Application
5.	**Field Work**
	• Introduction of Unit • Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. • Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. • Study of common plants, insects, birds and basic principles of identification. • Study of simple ecosystems-pond, river, Delhi Ridge, etc. • Conclusion & Real Life Application

C. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publication
1	Environmental Studies	Erach Barucha	Latest	UGC
2	Environmental Studies	Benny Joseph	Latest	Tata Mcgraw Hill
3	Environmental Studies	R. Rajagopalan	Latest	Oxford University Press
4	Principles of Environmental Science and Engineering	P. Venugoplan Rao	Latest	Prentice Hall of India.
5	Environmental Science and Engineering	Meenakshi	Latest	Prentice Hall India.

Code: BESCES1101 FUNDAMENTALS OF ENVIRONMENTAL SCIENCE 3.0 Credits [LTP: 3-0-0]

COURSEOUTCOMES:

Students would be able to:

CO1: Explain the concept of the interaction of human society with the earth's system. Explain howscience and the scientific method work to address environmental problems.

CO2: Explain sphere's interaction to earth's system and processes. Identify and analyze how matter andenergy change and cycle through the system as the spheres interact.

CO3: Analysis the physical and biological structures and examines how ecosystem characteristicsinteract with each other.

CO4: Evaluate general application of conserving biodiversity and general understanding aboutecosystems and ecosystem application.

CO5: Explain how the planet conserves matter and uses energy. The cycles move elements throughecosystems. Evaluate the storage of elements and recycle them.

A.OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction to Environmental Science**	8
2.	**Physical and Chemical Environment**	8
3.	**Ecological Concepts**	8
4.	**Ecological Principles**	7
5.	**Biogeochemical cycles**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Environmental Science**
	• Introduction of Unit • Scope and Importance of Environmental Science • Multidisciplinary nature of Environmental Science • Origin and Evolution of Biosphere: Atmosphere of the Primitive Earth. Early Life forms, Origin of Life- Chemical basis, Evolution of Life forms through ages (Geological time scale) • Conclusion & Real Life Application
2.	**Physical and Chemical Environment**
	• Introduction of Unit • Earth's spheres and its components: Atmosphere, Hydrosphere, Lithosphere and Biosphere • Interaction of all the components(Atmosphere, Hydrosphere, Lithosphere and Biosphere) • Conclusion & Real Life Application
3.	**Ecological Concepts**
	• Introduction of Unit • Concept of Ecosystems • Types of Ecosystems • Ecosystem structure and functioning • Energy flow • Food chains and food webs

	• Ecological pyramids • Conclusion & Real Life Application
4.	**Ecological Principles**
	• Introduction of Unit • Liebig's Law of Minimum • Shelford's Law of Tolerance • Combined Concept of Limiting Factors • Conclusion & Real Life Application
5.	**Biogeochemical Cycles**
	• Introduction of Unit • Definition and importance • Hydrological • Carbon • Oxygen • Nitrogen • Phosphorus • Sulphur • Conclusion & Real Life Application

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Fundamentals of Environmental Biology	Agrawal,K. C.	2001	Bikaner (India): Nidhi Publishers.
2.	Ecology: Principles and Applications	Chapman,J. L. and Reiss, M. J.	1995	Cambridge: University Press
3.	Environmental Encyclopedia	Cunningham, W.P. Cooper, T.H. Gorhani, E. and Hepworth, M.T.	2001	Mumbai: Jaico Publ. House
4.	Fundamentals of Ecology	Odum E.P.	1996	Dehradun: Natraj Publisher
5.	Fundamentals of Ecology	Odum E.P.	1971	USA: W.B. Saunders Co.
6.	Environmental Science.	Santra, S. C.	2001	New Central Book Agency (P) Ltd.
7.	Ecology and Environment.	Sharma, P. D.	1996	Meerut: Rastogi Publications.

Code: BESCES1102 ENVIRONMENTAL ECOLOGY & ECOSYSTEM DYNAMICS 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

Students would be able to:

CO1: Point out the various aspects of living organism and climatic factors - solar radiations, temperature, water and precipitation.

CO2: Point out about population dynamics like population growth, size, density, age, migration andimpact of population growth on ecosystem.

CO3: Discuss the food chains, food webs, Ecological pyramids, ecosystem function.

CO4: Discuss the Concepts, Types, Trends of Succession and Climax and stability of ecosystem

CO5: Compare the Characteristics of Biomes like Terrestrial, Forests, Grasslands, Fresh water,Marine, Lake, river.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Basic Principles of Ecology and Environment**	7
2.	**Population**	8
3.	**Ecosystem**	8
4.	**Succession**	8
5.	**Characteristics of Biomes**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basic Principles of Ecology and Environment**
	• Introduction of Unit • Definition and Scope • Biological levels of organization, population, community, ecosystem and biosphere • Climatic factors - Solar radiations, temperature, water and precipitation • Conclusion & Real Life Application
2.	**Population**
	• Introduction of Unit • Basic concepts, population characteristics – density, natality, mortality,Age-structure, population growth. • Ecological niche and habitat • Positive and negative interactions of populations – competition, predation, parasitism, mutualism • Conclusion & Real Life Application
3.	**Ecosystem**
	• Introduction of Unit • Basic concepts, components of ecosystem • Trophic levels, food chains and food webs • Ecological pyramids, ecosystem function. • Energy flow in ecological systems, energy efficiencies • Conclusion & Real Life Application

4.	**Succession**
	• Introduction of Unit • Concepts of succession • Types of Succession • Trends in succession • Climax and stability • Co-evolution and group selection • Conclusion & Real Life Application
5.	**Characteristics of Biomes**
	• Introduction of Unit • Terrestrial • Forests • Grasslands • Fresh water • Marine • Lake • River • Conclusion & Real Life Application

C. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publication
1	Concepts of Ecology	Kormondy	**1969**	Prentice hall
2	Ecology and Environment.	Sharma, P. D.	**2008**	Rastogi Publications
3	Ecology and Feild Biology	Smith, R. L.	**1996**	Harper Collins
4	Basic Ecology	Odum, E. P.	**1983**	Saunders Co. Publication
5	Environmental Science	Cunningham, W. P., & Saigo, B. W.	**1999**	Mc-Graw Hill Book Company
6	Ecology: Principles and Applications	Chapman, J. L., & Reiss, M. J.	**1995**	Cambridge University Press
7	Essentials of Ecology	Townsend, C., Harper, J., & Begon, M.	**2006**	Blackwell Science

Code: BESCES1103	INORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

Students would be able to:

CO1: Analyze the atoms based on atomic theory and periodic properties.

CO2: Identify the properties, interaction and energies of compounds with respect to their chemical bonding.

CO3: Predict the anomalous change in geometry of molecules on account of valence bond theory, VSEPR theory and Molecular orbital Theory.

CO4: Compare the trends in characteristic properties and synthesis of hydrides of *s*-block and *p*-block elements.

CO5: Categorize the properties of noble gases and its compounds with use in daily life applications.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Atomic Structure & Periodic Properties**	7
2.	**Ionic Bond, Metallic Bond & Weak Interactions**	7
3.	**Covalent Bond**	7
4.	**s-Block Elements & p-Block Elements**	8
5.	**Chemistry of Noble Gases**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Atomic Structure & Periodic Properties**
	• Introduction of the Unit • Bohrs Theory and its limitation • Heisenberg uncertainty principle • Quantum number and its Significance • Aufbau Principle, Hund's multiplicity rule and Pauli's exclusion principle • Electronic configuration of elements • Effective nuclear charge and shielding • Atomic and ionic radii • Ionization energy, electrode potential (use of redox potential-reaction feasibility) • Electron affinity and electro negativity evaluation • Trends in periodic table • Applications in predicting and explaining the chemical behavior • Periodic properties • Conclusion & Real life applications
2.	**Ionic Bond, Metallic Bond &Weak Interactions**

	• Introduction of the Unit • Ionic bond-General characteristics • Radius ratio effect and coordination number • Lattice defects, lattice energy and Born-Haber cycle • Solvation energy and solubility of ionic solids • Polarizing power and polarizability • Fajan's rules • Metallic Bond- Free electron, valence bond and band theories • Weak Interactions- Hydrogen bonding, Vander walls Force • Conclusion & Real life applications
3.	**Covalent Bond**
	• Introduction of the Unit • Valence bond theory and its limitations • Valence shell electron pair repulsion (VSEPR) theory with suitable examples(NH_3, H_30^+ SF_4, CIF_3, ICl_2, H_2O) • Molecular orbital theory • Bonding, nonbonding and antibonding molecular orbital's • Linear combination of atomic orbital's (LCAO)-homonuclear and heteronuclear (CO and NO) diatomic molecules. • Multicenter bonding in electron deficient molecules, • Bond strength and bond energy • Percentage ionic character from dipole moment and electro negativity difference • Conclusion & Real life applications
4.	**s-Block Elements & p-Block Elements**
	• Introduction of the Unit • s-Block Elements -Comparative study, diagonal relationships • Solvation and complexation tendencies including their function in biosystems • Hydride- classification, preparation and characteristics • Introduction to alkyl and aryls • p-Block elements-Comparative study in periodicity, diagonal relationship • Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, • Basic properties of halogens, interhalogens and polyhalides • Conclusion & Real life applications
5.	**Chemistry of Noble Gases**
	• Introduction of the Unit • Chemical properties of Noble gases • Chemistry of Xenon • Structure and bonding in Xenon compound • Theories of Bonding in noble gases compound • Conclusion & Real life applications

C. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publication
1	A New Concise Inorganic Chemistry	J. D. Lee	Latest	Chapman & Hall, London
2	Modern Inorganic Chemistry	R. C. Aggarwal	Latest	KitabMahal, Allahabad
3	Basic Inorganic Chemistry	F. A. Cotton, G. Wilkinson, and Paul L. Gaus	Latest	John Wiley & Sons, New York

Code: BESCES1104	ORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

Students would be able to:

CO1: Demonstrate electronic displacements according to bonding, shapes, reactivity andenergy consideration of reaction intermediate

CO2: Classify Hydrocarbons and discuss the methods of preparation of Hydrocarbons.

CO3: Categorize the stability and reactivity of hydrocarbons as per bonding and structure of hydrocarbons.

CO4: Compare the physical and chemical properties of Hydrocarbons.

CO5: Analyze the applications of various hydrocarbons and their derivatives.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Fundamentals of Organic Chemistry**	**8**
2.	**Alkanes**	**7**
3.	**Alkenes**	**7**
4.	**Alkynes**	**7**
5.	**Cycloalkanes, Cycloalkenes & Dienes**	**7**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Fundamentals of Organic Chemistry**
	• Introduction of the Unit • Electronic displacements: inductive effect, electromeric effect, resonance and hyperconjugation • Cleavage of Bonds: homolysis and heterolysis • Structure, shape and reactivity of organic molecules: nucleophiles and electrophiles • Reactive Intermediates: carbocations, carbanions and free radicals , nitrene, carbene, benzyne, Assigning formal charge • Types of organic reactions, energy considerations. • Methods of determination of reaction mechanism (product analysis, intermediates, isotopeeffects, kinetic and stereochemical studies) • Conclusion & Real life applications
2.	**Alkanes**
	• Introduction of the Unit • Alkanes:(Upto 5 Carbons) • IUPAC nomenclature of branched and unbranched alkyl group • Classification of carbon atoms in alkanes, Physical properties • Preparation: catalytic hydrogenation, Wurtz reaction, Kolbe synthesis, decarboxylation ofcarboxylic acid, Grignard reagent, Corey-house reaction • Reactions: free radical substitution: halogenations • Reactivity and selectivity • Conclusion & Real life applications
3.	**Alkenes**
	• Introduction of the Unit • Alkenes: (Upto 5 Carbons)

	• Preparation: elimination reactions: dehydration of alcohols and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (partial catalytic hydrogenation) and trans alkenes (birch reduction), Hofmanns elimination • Chemical reactions of alkenes –electrophilic and free radical additions. Epoxidation, mechanisms involved in hydrogenation, oxidation with $KMn0_4$, Substitution at the allylic and vinylic positions of alkenes, polymerization of alkenes • Reactions: cis-addition (alk. KMnO4) and trans-addition (bromine), addition of HX (Markownikoff's and anti-Markownikoff's addition), hydration, ozonolysis, oxymecuration–demercuration, Hydroboration-oxidation. • Industrial application of ethylene and propene • Conclusion & Real life applications
4.	**Alkynes**
	• Introduction of the Unit • Alkynes: (Upto 5 Carbons) • Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenationof tetra halides and dehydrohalogenation of vicinal-dihalides, acidity of alkynes • Reactions: formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, • ozonolysis and oxidation with hot alkaline. $KMnO_4$,hydroboration- oxidation, metal ammonia reduction, polymerization • Conclusion & Real life applications
5.	**Cycloalkanes, Cycloalkenes & Dienes**
	• Introduction of the Unit • Cycloalkanes: Nomenclature, method of formation, chemical reactions • Baeyer strain theory and its limitations • Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings, Mohrs Sachse theory • The case of cyclopropane ring: banana bond • Cycloalkenes: Nomenclature, method of formation, chemical reactions • Dienes: Nomenclature and classification of dienes • Structure of allenes and butadiene, methods of formation, polymerization, chemical reactions, 1,2and 1,4- additions, Diels-Alder reaction • conjugated and cumulated dienes • Conclusion & Real life applications

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	A Text Book of Organic Chemistry	O. P. Agarwal	Vol. I & II	Latest
2.	A Text Book of Organic Chemistry	B. S. Bahl and ArunBahl	Latest	S. Chand
3.	Organic Chemistry	S. M. Mukherji, S. P. Singh and R. P. Kapoor	Vol. I, II & III	Wiley Eastern Ltd. (New Age International)
4.	Organic Chemistry	Morrison & Boyd	Latest	Prentice Hall

Code: BESCES1105	OPERATING SYSTEMS	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Explain the role of operating system with its function and services. (Understanding)
CO2: Compare Various Algorithm used for CPU Scheduling, Memory management and Disk Scheduling Algorithm. (Evaluate)
CO3: Apply various concepts related with Deadlock to solve Problems. (Apply)
CO4: Analyse Protection and Security Mechanism in Operating System. (Analyse)

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction of Operating System**	6
2	**Scheduling**	8
3	**Process and Threads**	8
4	**Memory Management**	8
5	**File System Interface**	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction of Operating System**
	• Introduction of Unit • Operating System: Operating Systems Overview- Overview and Functions of operating systems • Protection and security, operating Systems structures • Services, system calls and their working, Batch, multiprogramming • Multitasking, time sharing, parallel, distributed & real -time O.S. • Conclusion & Real Life Application
2.	**Scheduling**
	• Introduction of Unit • Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms • Algorithm evaluation, multiple processor scheduling • Real time scheduling I/0 devices organization • I/0 devices organization, I/0 devices organization, I/0 buffering • Conclusion & Real Life Application
3.	**Process and Threads**
	• Introduction of Unit • Process concept, process scheduling, operations on processes • Threads, inter-process communication, precedence graphs, critical section problem • Semaphores, classical problems of synchronization. Deadlock problem, deadlock characterization • Deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock • Methods for deadlock handling • Conclusion & Real Life Application
4.	**Memory Management**
	• Introduction of Unit • Concepts of memory management, logical and physical address space, swapping • Contiguous and non- contiguous allocation, paging, segmentation, and paging combined with segmentation • Conclusion & Real Life Application

5.	File System Interface
	• Introduction of Unit • File system Interface- the concept of a file, Access Methods. • Directory Structure. File system mounting, file protection and sharing mechanism. • File System implementation- File system structure, file/directory implementation • Efficiency and performance; file allocation methods, Free-space management • Conclusion & Real Life Application

C. COMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Operating System Concepts	Abraham Silberchatz, Peter B. Galvin, Greg Gagne	8th edition.	CBH, Jaipur
2.	Operating Systems - Internals and Design Principles	Stallings	6th Edition	Pearson education.
3.	Operating systems- A Concept based Approach	D. M. Dhamdhere	3rd Edition	TMH, Delhi
4	Modern Operating Systems	Andrew S Tanenbaum	3rd edition	PHI
5	Principles of Operating Systems	B.L.Stuart	Latest	Cengage learning, India Edition
6	Operating Systems.	A.S. Godboie	2nd Edition	TMH

Code: BESCES1106 COMPUTER FUNDAMENTALS & C PROGRAMMING 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

Students would be able to:

CO1: Identify parts of computer hardware.
CO2: Evaluate data representation techniques like binary, hexadecimal and octal.
CO3: Design algorithms to solve small computer problems related to daily life.
CO4: Apply arithmetic operations and sequential programming using C Language.
CO5: Discriminate among while, for and do-while iterative statements.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Introduction of Computer Systems	8
2.	Introduction of C	5
3.	Operators and Expressions	6
4.	Control Structures	8
5.	Arrays, Strings and Functions	9

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction of Computer Systems**
	• Introduction of Unit • Definition of a Computer, History of Computers, Generations of Computers • Types of computer – based on size and working principle, Block diagram of a Computer with functional units (explanation) • Parts of a computer system, Information processing Cycle. • Definition of software and hardware, types of programming languages, assembler, compiler, interpreter, linker, loader (Definitions only) • Number system – decimal, binary,octal and hexadecimal number, inter conversion of decimal to binary and vice versa. • ASCII codes. Algorithm- definition, Characteristics, notations. • Flowchart-definition, Symbols used in writing the flow-chart • Writing an algorithm and flow-chart of simple problems • Conclusion & Real Life Application
2.	Introduction of C
	• Introduction of Unit • Features of C, basic C program structure, character set, • Tokens, keywords and identifiers.CT-nstants, variables • Ddata types, variable declaration, symbolic constant definition • Conclusion & Real Life Application
3.	Operators and Expressions
	• Introduction of Unit • C operators- arithmetic, relational, logical, bitwise, assignment, increment and decrement • Cconditional (?:) and special operators, Arithmetic expressions • Precedence of operators and associatively. Type conversions, mathematical functions • Definition of macro and pre-processor directives • Managing I/O operation – reading and writing a character • Formatted and unformatted/O functions • Conclusion & Real Life Application

4.	Control Structures
	• Introduction of Unit • Conditional control statements- if, if-else, nestedif, switch, go to statement, • While, do-while and for statements • Unconditional control statements- break, continue and return statements(definition and explanationwith syntax, flowchart and examples) • Conclusion & Real Life Application
5.	Arrays, Strings and Functions
	• Introduction of Unit • Definitions of an array, types-one and two dimensional array • Strings–definition, declaration and initialization of string variable, • string handling functions • Functions – definition, need, syntax for function declaration, function prototype • category of functions, nestingof functions, function with arrays, scope of variables • Parameter passing mechanism- call by value and call byreference. Recursion and Recursive function • Conclusion & Real Life Application

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Let us C	YashwantKanetkar	6th edition	PBH, Jaipur
2.	The C programming Language	Richie and Kenninghan	2004	Pearson education.
3.	Programming in ANSI C	Balaguruswamy	3rd Edition, 2005	TMH, Delhi

Code: BESCES1201	ENVIRONMENTAL SCIENCE LAB-I	1.0 Credits [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Design and carry out scientific experiments as well as accurately record and analyze the quality of water samples from different.

CO2: Impart the students a thorough knowledge of systematic qualitative analysis of wastewater samples and drinking water samples through physiochemical parameters.

CO3: Develop skills for qualitative analysis with the different instruments

CO4: Develop skills required for the qualitative analysis of water using chemical process.

CO5: Learn and apply basic techniques of sampling and preservation methods and significance of characterization of water and wastewater.

LIST OF EXPERIMENTS

1	Estimation of pH in the water sample
2	Estimation of Acidity in the water sample
3	Estimation of Alkalinity in the water sample
4	Estimation of Chloride in the water sample
5	Estimation of Free CO_2 in the water sample
6	Estimation of Residual chlorine in the water sample
7	Estimation of Total Hardness in the water sample.
8	Estimation of conductivity of the water sample.
9	Estimation of Total Dissolved Solids in the water sample
10	Estimation of Dissolved oxygen in the water sample
11	Qualitative estimation of Nitrate
12	Qualitative estimation of Phosphate

Code: BESCES1202	CHEMISTRY LAB-I	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.

CO2: Impart the students a thorough knowledge of Systematic qualitative analysis of mixtures containing two acid and two basic radicals

CO3: Develop skills for quantitative estimation using the different branches of volumetric Analysis.

CO4: Develop skills required for the qualitative analysis of organic compounds

CO5: Learn and apply basic techniques used in the organic laboratory for preparation, purification and identification of organic compounds.

LIST OF EXPERIMENTS

Inorganic Chemistry	
1	To analyze mixture contains two acidic and two basic radicals in a given mixture.
2	To analyze mixture contains two acidic and two basic radicals in a given mixture.
3	To analyze mixture containing three acidic and three basic radicals.
4	To analyze mixture containing three acidic and three basic radicals.
5	To analyze mixture containing three acidic and three basic radicals.
6	Estimation of $KMnO_4$ by oxalic acid.
Organic Chemistry	
7	To detect the functional group from the given organic compound (Alcohol/carbonyl compound).
8	To detect the functional group from the given organic compound (Nitrogen containing compound).
9	To determine the melting point of given organic compound (Naphthalene).
10	To determine the melting point of given organic compound (Urea).
11	To determine the boiling point of given organic compound (Ethanol).
12	To determine the boiling point of given organic compound (Benzene).

Code: BESCES1203	C PROGRAMMING LAB-I	1.0 Credits [LTP: 0-0-2]

COURSE OUTCOMES:

Student would be able to:

CO1: To design an algorithmic solution to a problem-using problem.
CO2: To define and drive the steps involved in problem solving.
CO3: To solve abstract and complex problems using modular design methodology.
CO4: To learn creation of C Language programming of give problem.
CO5: To development of C programs based on static and dynamic memory allocation.

A. List of Programs

Part A	
	• Find biggest number among 4 given numbers • Arithmetic operations using switch statement. • Find the Fibonacci series between M and N. • Prime numbers between M and N • Binary to Decimal conversion • Sorting an unsorted array • Searching an element in an array. • Addition of two matrices • Find the factorial of a number using function. • Accept N words and make it as a sentence by inserting blank spaces and a full stop at the end. • Printing the reverse of a string.
Part B	
	• Searching an element in an array using pointers. • Checking whether the given matrix is an identity matrix or not • Addition and subtraction of two matrices. • Multiplication of two matrices. • Reverse of an integer. • Odd and even series of N numbers. • Get a string and convert the lowercase to uppercase and vice--versa using getchar() and putchar().

CODE: BULCHU1201	FOUNDATION ENGLISH	1Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Demonstrate the grammar skills involved in writing sentences and short paragraphs.

CO2: Build up a good command over English grammar and vocabulary to be able to ace error spotting.

CO3: Define unknown words in sentence level context using a picture dictionary or by creating a memory link for support.

CO4: Understand, analyze and effectively use the conventions of the English language.

CO5: Developtheir interest in reading and enhance their oral and silent reading skills along with sharpen their critical and analytical thinking.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Basics of Grammar**	**8**
2	**Spotting the Grammatical Errors and Rectification**	**2**
3	**Vocabulary Building**	**4**
4	**Basics of Writing Skills**	**2**
5	**Reading Comprehension**	**8**

B. DETAILED SYLLABUS

LIST OF LABS	
1.	Parts of Speech: Theory & Practice through various Exercises
2.	Sentence Structures: Theory & Practice through various Exercises
3.	Tenses: Theory & Practice through various Exercises
4.	Spotting the Errors: Applying the rules and Practice Questions
5.	Vocabulary Building-I: Practice by sentence formation
6.	Vocabulary Building-II: Practice by sentence formation
7.	Paragraph Writing
8.	Article Writing
9.	Précis Writing
10.	Formal & Informal Letter Writing
11.	Reading Comprehension- I: Beginner's level reading and Answering the Questions (Competitive Exams)
12.	Reading Comprehension- II: Intermediate's level reading and Answering the Questions (Competitive Exams)

Code: BESCES1601	Talent Enrichment Programme (TEP-I)	1 Credits [LTP 0-0-1]

OVERVIEW AND OBJECTIVES: The objective of Social Outreach, Discipline & Extra Curricular Activities is to provide students with the opportunities to enhance job-fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environmentin the University. TEP is integrated into the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories**.**

Social Outreach, Discipline & Extra Curricular Activities shall be evaluated irrespective of period/time allocation (as in the case of Extra Curricular activity) in the teaching scheme as 1 **credit** course. The record related to discipline, related activities are maintained for each student, and they shall be evaluated for the same also. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendanceof these classes shall be recorded and accounted in the total attendance.

Code: BESCES2101 ENVIRONMENTAL MICROBIOLOGY 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES

Students will be able to:-

CO1: Point out the Classification, types of microorganism and Microbial growth curve such as lag phase, acceleration phase, exponential phase, deceleration phase, stationary phase, death phase

CO2: Demonstration the Positive and negative interactions of microorganism like Mutualism, Parasitism, Amensalism, Competition, Predation, Protocooperation.

CO3: Produce Microbial habitat in the aquatic environment and Microbial characteristics of fresh and marine water.

CO4: Point out the sources, habitat, communities and survival conditions of microbial in air.

CO5: Point out the habitat and different Microbial biogeochemical cycling like Carbon cycle, Nitrogen cycle, Sulphur cycle, Phosphorus

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Growth and Distribution of Microorganisms in the Environment	7
2.	Basics of Microbial Interactions in the Environment	9
3.	Microbiology of Water	6
4.	Microbiology of Air	7
5.	Microbiology of Soil	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Growth and Distribution of Microorganisms in the Environment**
	• Introduction of the Unit • Basic Classification of microorganisms • Types of microorganism on the basis of nutrition • Factors affecting microbial growth(Temperature, pH, Oxygen concentration, Pressure and radiation) • Microbial growth curve (Lag phase, acceleration phase , exponential phase, deceleration phase, stationary phase, death phase) • Conclusion & Real Life Application
2.	**Basics of Microbial Interactions in the Environment**
	• Introduction of the Unit • Interaction among the microbial populations (Positive and negative interactions) • Mutualism • Parasitism • Amensalism • Competition • Predation • Protocooperation • Commensalism • Mycorrhizae-Ectomycorrhizae and Endomycorrhizae • Conclusion & Real Life Application
3.	**Microbiology of Water**
	• Introduction of the Unit

	• Microbial habitat in the aquatic environment
	  ○ Planktonic environment
	  ○ Benthic habitat
	  ○ Microbial mats
	  ○ Biofilms
	• Microbial characteristics of fresh and marine water
	• Conclusion & Real Life Application

4.	**Microbiology of Air**
	• Introduction of the Unit • Sources of microorganisms in air • Physical/Microbial habitats in air • Microbial communities in air • Factors affecting microbial survival in air • Conclusion & Real Life Application
5.	**Microbiology of Soil**
	• Introduction of the Unit • Soil habitat (Lithosphere) • Microbial biogeochemical cycling • Carbon cycle • Nitrogen cycle • Sulphur cycle • Phosphorus • Rhizosphere • Conclusion & Real Life Application

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	*Introduction to Biodeterioration*	Dennis Allsopp, K. J.	2004	*(2nd ed.).* Cape Town, South Africa: Cambridge University Press.
2.	*Environmental microbiology: principles and applications.*	Jjemba, P. K.	2004	Science Publishers
3.	*Microbial Ecology*	Barton, L., D. E.	2011	New Jersey: JOHN WILEY & SONS, INC., PUBLICATION
4.	*Textbook of Environmental Environmental Microbiology.*	Mohapatra, P. K.	2008	New Delhi: I. K. International Publishing House.
5.	*Microbiology*	Prescott, L. M.	2002	The McGraw−Hill Companies
6.	*Microbial Ecology: Fundamental and Applications*	Atlas, R.M., R. B.	2005	*(4th ed.).* New Delhi: Pearson Education Pvt. Ltd.
7.	*Environmental Microbiology*	Srivastava, M.	2008	Shree Publishers & Distributors.

Code: BESCES2102 NATURAL RESOURCE CONSERVATION 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

Students would be able to:

CO1: Point out the ecological processes, including human impacts that influence ecosystems change,natural succession and the future sustainability of natural resources.

CO2: Point out the profile, types, degradation, conservation of soil and forest resources in India.

CO3: Introduce to water sources and water conservation methods like watershed management, rainwaterharvesting.

CO4: Point out the Types, recourses, Environmental impact of Minerals

CO5: Point out the non-renewable energy resources and renewable energy resources.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Introduction to Natural Resources**	7
2.	**Land Resources**	7
3.	**Water Resources**	6
4.	**Mineral Resources**	9
5.	**Energy Resources**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Natural Resources**
	• Introduction of unit • Classification-Based on Chemical nature, Availability/Abundance, Occurrence, Origin,Utility • Sustainable Development- Concept and Basic aspects • Agenda 21: Salient features • Conclusion & Real Life Application
2.	**Land Resources**
	• Introduction of unit • Soil and its characteristics • Soil Profile • Types of soil in India • Soil degradation (Physical and chemical) • Soil conservation • Forest resources of India- Forest types and distribution • Importance and Conservation of forest • Conclusion & Real Life Application
3.	**Water Resources**

	• Introduction of unit • Sources and use of water(Surface and Ground water) • Water conservation- • Watershed management • Rainwater harvesting (Paar system. Talab / Bandhis, SazaKuva, Johad, Pat,Naada / Bandha,Chandela Tank, Bundela Tank, Kunds / Kundis, Kuis / Beris, Jhalaras, Nadis, Tobas) Conclusion & Real Life Application
4.	**Mineral Resources**
	• Introduction of unit • Types of Minerals (metallic and non-metallic) • Uses of mineral resources • Environmental Impacts of mining • Conclusion & Real Life Application
5.	**Energy Resources**
	• Introduction of unit • Classification of energy resource: Conventional and Non-conventional • Non-renewable energy resources: fossil fuels(coal, oil and natural gas) • Renewable energy resources: Hydroelectric power, Tidal power, wind power, biomass and solar energy • Conclusion & Real Life Application

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Global Environmental Negotiations I: Green Politics	Agarwal, A., Narain, S., & Sharma, A.	1999	New Delhi: Centre for Science and Envionment
2.	Beyond Rio	Ahmaob, I., & Deloman, J.	1995	Macmillan.
3.	Encyclopedia of Environment: Environmental Problems and Policies	Field, B.	2005	Vol, I and II. New Delhi: Anmol Publications.
4.	Environmental Problems and the United Nations	Khanna, G. N.	1990	New Delhi: Ashish Publishing House
5.	Our Common Future, Report of the OECD.	-	1987	Oxford University Press.

Code: BESCES2103 ORGANIC CHEMISTRY 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Distinguish between aromatic and antiaromatic compounds by comparing their structures along with their electrophilic aromatic substitution reactions.

CO2: Explain basic principles of stereochemistry as well as differentiate configuration and conformation, Flying wedge and Fischer projection formula

CO3: Categorize Nucleophilic Substitution (S_N1, S_N2 and S_Ni) reactions with energy profile diagram.

CO4: Explain the addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reaction, relative reactivities of alkyl, allyl, vinyl and aryl halides.

CO5: Classify and prepare 1°, 2° and 3° alcohols and demonstrate their reaction.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Aromaticity**	7
2	**Stereochemistry**	8
3.	**Alkyl Halides**	7
4.	**Aryl Halides**	7
5.	**Alcohols**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Aromaticity**
	• Introduction of the Unit • Aromaticity: Nomenclature of benzene derivatives. The aryl group, aromatic nucleus and sidechain. • Structure of benzene: Kekule structure. • Resonance theory and Molecular orbital theory • Stability and carbon-carbon bond lengths of benzene, resonance structure, MO diagram • Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocycliccompounds with suitable examples • Electrophilic aromatic substitution: mechanism, role of sigma and pi-complexes. • Halogenation, sulphonation, mercuration, Friedel-Crafts reactions and Mechanism of nitration,chloromethylation. • Energy profile diagrams. Activating and dectivating substituents. • Directive influence - orientation and ortho/para ratio. • Side chain reactions of benzene derivatives. Birch Reduction. • Conclusion & Real life applications
2.	**Stereochemistry**
	• Introduction of the Unit • Concept of isomerism • Types of isomerism • Difference between configuration and conformation • Conclusion & Real Life Application

	• Flying wedge and Fischer projection formula • Optical isomerism- Elements of symmetry, molecular chirality, stereogenic centre, opticalactivity • Properties of enantiomers, chiral and achiral molecules with two stereogeniccentre • Diastereomers,threo and erythro isomers • Mesocompounds • Resolution of enantiomers • Inversion, retention and racemization. • Relative and absolute configuration, sequence rules D and L and R/S system of nomenclature. • Geometric isomerism-Determination of configuration of geometrical isomers, ; *cis– trans* and E / Z nomenclature • Geometric isomerism in oximes and alicyclic compounds • Conformational isomerism-Newman projection and saw house formula • Conformational analysis of ethane, n butane and cyclo hexane • Conclusion & Real life applications
3.	**Alkyl Halides**
	• Introduction of the Unit • (Upto 5 Carbons) Nomenclature • Preparation*:* from alkenes *and* alcohols, methods of formation of alkyl halides. • Reactions: hydrolysis, nitrite & nitro formation, nitrile &isonitrile formation. Williamson's ethersynthesis: Elimination versus substitution • Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions with energy profile diagram • Polyhalogen compounds: Chloroform, carbon tetrachloride, DDT, BHC • Conclusion & Real life application
4.	**Aryl Halides**
	• Introduction of the Unit • Aryl Halides Preparation:(Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions • Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. • Relative reactivities of alkyl, allyl, vinyl and aryl halides • Reactions *(*Chlorobenzene*):* Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$). • Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides • Conclusion & Real life applications
5.	**Alcohols**
	• Introduction of the Unit • Alcohols: • Classification and Nomenclature**.** • Monohydric Alcohols-Preparation*:* Preparation of 1^o, 2^o and 3^o alcohols: using Grignard reagent,Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters,Hydogen bonding, Acidic Nature • Reactions*:* With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, conc. HNO_3), Oppeneauer oxidation • Dihydric Alcohols*:* (Upto 6 Carbons) Methods of Formation, Chemical Reactions of Vicinal Glycols, oxidation of diols, Pinacol-Pinacolone rearrangement. • TrihydricAlcohols: Methods of Formation, Chemical Reactions of Glycerol's. • Conclusion & Real life applications

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	A Text Book of Organic Chemistry	K. S. Tiwari, S. N. Mehrotra and N. K. Vishnoi	Latest	Vikas Publishing House
2.	Modern Principles of Organic Chemistry	M. K. Jain & S. C. Sharma	2015	Vishal Publishing Co
3	A Text Book of Organic Chemistry	B. S. Bahl and ArunBahl	Latest	S. Chand
4	Organic Chemistry	S. M. Mukherji, S. P. Singh and R. P. Kapoor	Vol. I, II & III	Wiley Eastern Ltd. (New Age International)
5	Organic Chemistry	Morrison & Boyd	Latest	Prentice Hall

Code: BSACSA02104	PHYSICAL CHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Determine structure of compounds by X- ray diffraction methods and compare the chemical behavior and physical properties of common substances.

CO2: Apply the concept of liquid crystals in applications of advanced technologies

CO3: Differentiate real gases from ideal gases at different temperature and pressure and explain methods of liquefaction of gases.

CO4: Interpret the stability regions using Phase diagrams of one component and two component system and compounds with congruent and incongruent melting point.

CO5: Explain fundamental principle of thermodynamic and thermo chemistry.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Solid State**	**7**
2.	**Liquid State**	**7**
3.	**Gaseous State**	**8**
4.	**Phase Equilibrium**	**6**
5.	**Thermodynamics**	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Solid State**
	• Introduction of the Unit • Solid state: 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 Braggs equation • Determination of crystal structure of NaCl, KCl and CsCl(Laue's method and powder method)**.** • Conclusion & Real life applications
2	**Liquid State**
	• Introduction of the Unit • Liquid State: Surface tension of liquids, capillary action, surface tension and temperature, interfacial tension, surface active agents, the Parachor and chemical constitution (atomic and structural parachors). • Viscosity of liquids, experimental determination of viscosity coefficient, its variation with temperature. • Intermolecular forces, structure of liquids (a qualitative description). • Structural difference between solid, liquid and gases • Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure ofnematic and cholestric phases. Thermography and seven-segment cell. • Conclusion & Real life applications

3	**Gaseous State**
	• Introduction of the Unit • Gaseous State :Kinetic theory of gases, ideal gas laws • Behavior of real gases - the Vander Waal's equation • Critical phenomena - critical constants of a gas and their determination • PV isotherms of real gases, continuity of state, Vander Waals equation and critical state • Principle 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 • Liquefaction of gases (based on Joule-Thomson effect) • Conclusion & Real life applications
4	**Phase Equilibrium**
	• Introduction of the Unit • Phase Equilibrium:Phases, components and degrees of freedom of a system, • Gibbs Phase Rule and its thermodynamic derivation • Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, • Bi-Cd system, Pb- Ag system, desilverisation of Pb • Solid Solutions-congruent and incongruent melting points • Solid solutions-Compound formation with congruent melting point of Mg-Zn and incongruent melting point of NaCl –H_2O system • Freezing Mixtures • Conclusion & Real life applications
5	**Thermodynamics**
	• Introduction to the Unit • **Thermodynamics terms**: systems, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamics 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 law-Joule Thomson co-efficient and inversion temperature. • 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. • **Second law of thermodynamics**: Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. • Concept of entropy: Entropy as a state function, entropy as a function of Volume and temperature, entropy as a function of pressure and temperature, entropy change in physical change. • **Third law of thermodynamics**: Statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, • Conclusion & Real life applications

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Physical Chemistry	G.M. Barrow	International student edition	McGraw Hill
2.	Physical Chemistry through problems	SK Dogra & S Dogra	latest	Wiley Eastern Ltd
3.	Physical Chemistry	R.A.Alberty	latest	Wiley Eastern Ltd

Code: BESCES2105	DATA STRUCTURE	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

Students would be able to:

CO1: Implement the concept of Dynamic memory management, data types, algorithms, Big Onotation.
CO2: Discuss basic data structures such as arrays, linked lists, stacks and queues.
CO3: Describe the hash function and concepts of collision and its resolution methods
CO4: Solve problem involving graphs and trees.
CO5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Stack	8
2.	Queue and Linked List	8
3.	Searching Techniques	8
4.	Tree	8
5.	Graphs and Hashing	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Stack**
	• Introduction of unit • Definition of Data Structure and types with examples • Time complexity and Notations, Basic Stack Operations • Representation of a Stack using Static Array and Dynamic Array • Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions and Towers of Hanoi. • Conclusion & Real life applications
2.	Queue and Linked List
	• Introduction of unit • Definition and example, operations on queues, types of queue • Sequential representation,disadvantages of ordinary queue, circular queue and priority queue (concepts only) • Linked list–Definitions and types of lists, operations on Singly linked list, stack and queueimplementation using linked list • Circular and doubly linked list (concepts only) • Conclusion & Real life applications
3.	**Searching Techniques**
	• Introduction of unit • Sequential and binary search. Sorting Techniques: Basic concepts, • Sorting by: bubble sort, Insertionsort, selection sort, quick sort • Heap sort, merge sort, radix sort and counting sorting algorithms • Conclusion & Real life applications
4.	**Tree**

	• Introduction of unit • Tree definition, representation, types of tree • Tree terminologies with an example, Binary tree, linkedlist representation of binary tree • Tree traversals, binary search tree and its applications • Conclusion & Real life applications
5.	**Graphs and Hashing**
	• Introduction of unit • Graphs: Basic concepts, Different representations of Graphs, Graph Traversals (BFS & DFS),Minimum Spanning Tree (Prims &Kruskal), Dijkstra's shortest path algorithms • Hashing: Hash function, Address calculation techniques, Common hashing functions • Collisionresolution: Linear and Quadratic probing, Double hashing • Conclusion & Real life applications

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	Data Structures and Algorithm Analysis in C	Weiss	II Edition,	Pearson Education, 2001
2	Schaum's outline series Data structures	Lipschutz	Latest	Tata McGraw-Hill
3	Data Structures and program designing using 'C'	Robert Kruse	Latest	Pearson Education,
4	Programming in ANSI C.	E. Balaguruswamy	Latest	Tata McGraw- Hill
5	Data Structures Using C	Bandyopadhyay	1999	Pearson Education,
6	Data Structures Using C	Tenenbaum	2000	Pearson Education,

Code: BESCES2106	COMPUTER NETWORKS	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

Students will be able to:

CO1: Understand computer network basics, network architecture, TCP/IP and OSI reference models.CO2: Identify and understand various techniques and modes of transmission.
CO3: Describe data link protocols, multi-channel access protocols and IEEE 802 standards for LAN.
CO4: Describe routing and congestion in network layer with routing algorithms and classify IPV4addressing scheme.
CO5: Understand network security and define various protocols such as FTP, HTTP, Telnet, and DNS.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Introduction of Computer Network	8
2.	Application layer	8
3.	Transport Layer	8
4.	Network Layer	8
5.	Data Link Layer	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction of Computer Network**
	• Introduction of unit • Definition and goals of computer network. • Types of Networks- Broadcast, point- to -point , LAN, WAN, MAN, network topologies • Wireless network example, Internet and its applications OSI model and TCP/IT model • Conclusion & Real life applications
2.	**Application layer**
	• Introduction of unit • Application Layer: Principles of computer applications • Web and HTTP, E-mail • DNS, Socket programmingwith TCP and UDP • Conclusion & Real life applications
3.	**Transport Layer**
	• Introduction of unit • Transport Layer: Introduction and transport layer services, Multiplexing and Demultiplexing • Connection lesstransport (UDP), Principles of reliable data transfer, Connection oriented transport (TCP), Congestion control • Conclusion & Real life applications
4.	**Network Layer**
	• Introduction of unit • Network Layer: Introduction, • Virtual and Datagram networks, study of router, IP protocol and addressing inthe Internet • Routing algorithms, Broadcast and Multicast routing. • Conclusion & Real life applications

5.	Data Link Layer
	• Introduction of unit • The Link layer: Introduction and link layer services • Error-detection and correction techniques • Multipleaccess protocols, addressing, Ethernet, switches. • Conclusion & Real life applications

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	Computer Networking- A Top-Down approach	Kurose and Ross	5th edition	Pearson Education, 2001
2	Computer Networks- A Top-Down Approach	Behrouz Forouzan	Latest	Tata McGraw-Hill
3	Computer Networks	Andrew Tanenbaum	(4th edition),	Prentice Hall
4	Computer Networking and the Internet	Fred Halsall	(5th edition	Addison Wesley
5	Data Communications and Networking	Behrouz Forouzan,	(4th edition)	McGraw Hil

Code: BESCES2201 ENVIRONMENTAL SCIENCE LAB -II 1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Design a vegetation of local area/University campus and Herbarium preparation.

CO2: Impart the students a thorough knowledge of systematic analysis of component in plant leaves.

CO3: Develop skills for qualitative and quantitative analysis with the different instruments.

CO4: Develop skills required for the qualitative and quantitative analysis in fieldwork.

CO5: Learn and apply basic techniques for vegetation study in field.

LIST OF EXPERIMENTS

Sr. No.	**Experiments**
1.	Study of vegetation of local area/University campus and Herbarium preparation
2.	To find out minimum size and number of the quadrat for vegetation study
3.	Study of vegetation density, frequency and abundance by quadrat method
4.	Study of dominance of plant species by quadrat method
5.	To calculate the leaf area index
6.	To calculate percent leaf injury
7.	Estimation of chlorophyll content in leaves
8.	Determination of moisture percentage in soil
9.	Determination of organic carbon in soil
10.	Determination of pH of in soil

Code: BESCES2202	CHEMISTRY LAB-II	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Identify the physical and chemical properties of common organic functional groups.

CO2: Learn the concept of separating the mixture.

CO3: Become familiar with instrumental analysis techniques in chemistry.

CO4: Understand the concept of surface tension and viscosity.

CO5: Understand the states of matter.

LIST OF EXPERIMENTS

Organic Chemistry	
1	To determine the functional group and identify the given organic compound.
2	To determine the functional group and identify the given organic compound.
3	To determine the functional group and identify the given organic compound.
4	To crystallize s acetanilide from hot water
5	To purify the given organic mixture by Sublimation
6	To separate the mixture (1 solid+1 liquid) by distillation.
Physical Chemistry	
7	To determine the surface tension of the pure liquid (alcohol etc.) with the help of Stalagmometer.
8	To determine the viscosity of the given liquid with the help of viscometer.
9	To determine critical solution temperature and composition of phenol water system.
10	To determine the percentage composition of a given mixture (non-interacting system) by viscosity method/ surface tension method.
11	Estimation of Fe(II) with $K_2Cr_2O_7$ using internal indicator (diphenylamine, N-phenylanthranilic acid) and discussion of external indicator.
12	Estimation of sodium carbonate using standardized HCl.

Code: BESCES2203	DATA STRUCTURE LAB-II	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOME:
Student would be able to:
CO1: Select appropriate data structures as applied to specified problem definition.
CO2: Implement operations like searching, insertion, and deletion, traversing mechanism etc.on various data structure.
CO3: Implement appropriate sorting/searching technique for given problem.
CO4: Solve problem involving graphs, trees and heaps
CO5: Determine and analyze the complexity of given Algorithms.

LIST OF EXPERIMENTS:

Part A	
	1. Write a simple C program on a 32 bit compiler to understand the concept of array storage, sizeof a word. Find the address of an element and verify it with the theoretical value. 2. Simulate a stack, queue and circular queue and DE queue using a one dimensional array as storageelement. 3. Represent a 2-variable polynomial using array. 4. Represent a sparse matrix using array
Part B	
	1. Implement singly, doubly and circularly connected linked lists 2. Repeat exercises 2, 3 & 4 with linked structure. 3. Implementation of binary tree with operations like addition, deletion, traversal. 4. Depth first and breadth first traversal of graphs represented using adjacency matrix and list. 5. Implementation of binary search in arrays and on linked Binary Search Tree. 6. Implementation of different sorting algorithm like insertion, quick, heap, bubble

Code: BULCHU2201	HUMAN VALUES & PROFESSIONAL ETHICS	1Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Understand the importance of human values and learn from others' experiences to become the conscious practitioners of the same.

CO2: Enhance their self-esteem, confidence and assertive behaviour to handle difficult situations with grace, style, and professionalism

CO3: Distinguish among various levels of professional ethics while developing an understanding ofthem as a process in an organization.

CO4: Implement emotional intelligence to achieve set targets and excel in interpersonal as well as intrapersonal

CO5: Demonstrate knowledge of personal beliefs and values and a commitment to continuingpersonal reflection and reassessment.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Introduction to Human Values**	**6**
2	**Study of Self**	**6**
3	**Introduction to Professional Ethics**	**8**
4	**Emotional Intelligence**	**2**
5	**Life Skills & Value Education**	**2**

B. DETAILED SYLLABUS

LIST OF LABS	
1.	Human Values: Love & Compassion
2.	Truth, Non-Violence, Righteousness
3.	Peace, Service, Renunciation (Sacrifice)
4.	Self-Esteem: Do's and Don'ts to develop positive self-esteem
5.	Self-Assertiveness: Development of Assertive Personality
6.	Ambition & Desire: Self & Body (concepts & differences)
7.	Professional Ethics: Personal & Professional Ethics
8.	Emotional Intelligence: Skill Building for Strengthening the Elements of Self-awareness, Self-regulation, Internal motivation, Empathy, Social skills
9.	Governing Ethics & Ethics Dilemma
10.	Profession, Professionalism & Professional Risks
11.	Professional Accountabilities & Professional Success
12.	Life Skills & Value Education

Code: BESCES2601	Talent Enrichment Programme (TEP-II)	1 Credits [LTP 0-0-0]

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TEP is integrated into the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories**.**

Social Outreach, Discipline &Extra Curricular Activities shall be evaluated irrespective of period/time allocation (as in the case of Extra Curricular activity) in the teaching scheme as 1 **credit** course. The record related to discipline, related activities are maintained for each student, and they shall be evaluated for the same.It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of these classes shall be recorded and accounted in the total attendance.

Code: BESCES3101 ENVIRONMENTAL POLLUTION AND CONTROL-I 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Explore the nature and types of air pollutants and their effects on environment and human health.

CO2: Point out the different methods of air pollution control and equipment to control air pollution.

CO3: Explore the nature and types of water pollutants and their effects on environment and human health.

CO4: Point out the different treatment and control methods for water pollution.

CO5: Explore the nature and types of noise pollutants and their effects on environment and human health.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Air Pollution and its Effects**	7
2.	**Air Pollution Control Methods**	7
3.	**Drinking Water & its Treatment Methods**	8
4.	**Water Pollution and its Effects**	6
5.	**Noise Pollution and its Control**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Air Pollution and its Effects**
	• Nature of pollutants: Biological, Chemical and Physical • Types of air pollutants; their characteristics and sources • Effects of major air pollutants(SOx, NOx, CO_2, O_3 PAN, PM_{10} & PM $_{2.5}$)
2.	**Air Pollution Control Methods**

	• Basic methods of air pollution control (Reduction at source, change of process)
	• Equipment used to control air pollution & their working principles
	  ○ Cyclones,
	  ○ ESP
	  ○ fabric filters
	• Wet scrubbers

3.	**Water Pollution and its Effects**
	• Sources and types of water pollutants (Inorganic, organic, O_2 demanding, thermal, plant nutrients, sediments, radioactive and infectious agents) • Effects of water pollutants on human health and environment
4.	**Drinking Water & its Treatment Methods**

	• Potable drinking water
	• Treatment methods
	  ○ Coagulation
	  ○ Flocculation,
	  ○ Filtration and
	• Disinfection

5.	**Noise Pollution and its Control**

	• Major sources of Noise pollution • Effects of noise pollution on human health • Control of noise pollution

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Living In The Environment	Miller, T.G., S. E.	2012	*(17th Ed.).* Usa: Brooks/Cole Cenage Learning.
2.	Environmental And Pollution Science	Pepper, I., C. P.	2006	*(2nd Ed.).*Academic Press
3.	Environmental Pollution And Control	Pierce, J., R. E.	1998	Usa: Butterworth-Heinemann (Elsevier)
4.	Environmental Chemistry	Kaur, H.	2014	*(8th Ed.).* Meerut: Pragati Prakashan.
5.	Air Pollution.	Rao, M.N., H. R.	1989	New Delhi: Tata Mcgraw Hill Publishing Company Limited
6.	Environmental Science: A Global Concern	Cunningham, W. P., & Cunningham, M. A.	2012	*(12th ed.).* The McGraw-Hill Companies, Inc.

Code: BESCES3102	INORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-

COURSE OUTCOMES: The students would be able to:
CO1: Describe the electronic configuration, atomic radii, ionic radii, oxidation state of lanthanides andtheir separation.
CO2: Differentiate between Lanthanides and Actinides and learn the separation techniques of trans-uranium elements.
CO3: Demonstrate the preparation, structure and industrial applications of inorganic polymers.
CO4: Interpret the chemistry of coordination compounds on the basis of Werner's Theory and itsindustrial applications.
CO5: Examine the basic principle of crystallization, distillation, solvent extraction, TLC and columnchromatography.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Lanthanides**	8
2.	**Actinides**	7
3.	**Inorganic Polymer**	7
4.	**Coordination Compounds**	8
5.	**Separation Techniques and Chromatography**	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Lanthanides**
	• Introduction to the Unit • **Lanthanides:** Comparative study of lanthanide elements with respect to electronic configuration, atomic and ionic radii, oxidation state and complex formation. • Lanthanide contraction. Occurrence and principles of separation of lanthanides. • General features and chemistry of Lanthanides • Conclusion & real life application
2.	**Actinides**
	• Introduction to the Unit • **Actinides:** Comparative study of actinide elements with respect to electronic configuration, atomic and ionic radii, oxidation states and complex formation; • Occurrence and principles of separation. • General features and chemistry of actinides, principles of separation of Np, Pu and Am from U. Trans-Uranium elements • Comparison of Lanthanides and Actinides • Conclusion & real life application
3.	**Inorganic Polymer**
	• Introduction to the Unit • **Inorganic Polymer:** Classification, Preparation and Structure of silicones, silicon resin,

	silicon rubber, silicon fluid, industrial application of silicones • Preparation, properties, substitution reaction and structure of phosphazenes • Conclusion & real life application.
4.	**Coordination Compounds**
	• Introduction to the Unit • **Coordination Compounds:** Werner's theory, nomenclature, chelates, stereo-chemistry of coordination numbers 4, 5 and 6. • Nomenclature and isomerism in coordination complexes. • Important applications of coordination compounds. • Theories of metal-ligand bonding in transition metal complexes- Sidgwick effective atomic number concept, • valence bond theory of coordination compounds • Conclusion & real life application
5.	**Separation Techniques and Chromatography**
	• Introduction to the Unit • **Separation Techniques:** Principles and process of solvent extraction • the distribution law and partition coefficient, batch extraction, continuous extraction and counter current distribution • Gravimetric methods, theory of precipitation, co-precipitation, post precipitation, theory of purifying the precipitates • **Chromatography:** Classification of chromatographic methods, general principle and application of adsorption, Partition chromatography, Ion-exchange, thin layer and paper chromatography • Conclusion & real life application

C. RECOMMENDED STUDY MATERIAL:

Sr. No.	Reference Book	Author	Edition	Publication
1.	A New Concise Inorganic Chemistry	J. D. Lee	5th Edition	Chapman & Hall, London
2.	Modern Inorganic Chemistry	R. C. Aggarwal	1st Edition	KitabMahal, Allahabad
3.	Basic Inorganic Chemistry	F. A. Cotton, G. Wilkinson, and Paul L. Gaus	3rd Edition	John Wiley & Sons, New York

Code: BESCES3103 PHYSICAL CHEMISTRY 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Apply Raoult's law on colligative properties, abnormal molar mass, degree of dissociation/association

CO2: Derive integrated rate expressions for studying kinetics of zero order first order To derive integrated rate expressions for studying kinetics of zero order, first order, second order and third order reaction by differential and integration method and solve numerical problems.

CO3: Identify the order of reaction using conductometric, potentiometric, optical, plarimetry and spectrophotometermethod and explain Arhenius equation, Simple collision theory and Transition state theory.

CO4: Interpret the equilibrium constant using Le Chatelier's principle, Clapeyron equation and Clausius-Clapeyron equation

CO5: Apply the effect of common ion on solubility equilibria in practical assignments and calculate hydrolysis constant, degree of hydrolysis and pH for different salts.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Solutions	7
2.	Chemical Kinetics I	7
3.	Chemical Kinetics II	7
4.	Chemical Equilibrium	7
5.	Ionic Equilibrium	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Solutions**
	• Introduction of the Unit • Ideal and non ideal solutions • Methods of expressing concentrations, activity and activity coefficients • Dilute solutions-colligative properties, Raoults law • Relative lowering of vapour pressure, Molecular weight determination • Osmosis, Law of osmotic pressure and its determination, determination of molecular weight from osmotic pressure • Elevation of boiling point and depression in freezing point • Abnormal molar mass, degree of dissociation and association of molecules • Conclusion of the Unit
2.	**Chemical Kinetics I**
	• Introduction of the Unit • **Chemical kinetics and its scope**, rate of a reaction, factors influencing the rate of a reaction- concentrations, temperature, pressure, solvent, light, catalyst, concentration dependence of rates • Mathematical characteristics of simple chemical reaction- zero order, first order, second order, pseudo order, half-life and mean life. • Determinations 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 • Conclusion of the Unit
3.	**Chemical Kinetics II**
•	• Introduction of the Unit • **Experimental methods of chemical kinetics**: conductometric, potentiometric, optical methods, polarimetry and spectrophotometery. • Theories of chemical kinetics, Effect of temperature on rate of reaction, • Arrhenius Equation, concepts 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 • Conclusion of the Unit
4.	**Chemical Equilibrium**
•	• Introduction of the Unit • **Chemical Equilibrium:** Equilibrium constant and Free energy change • Thermodynamic derivation of the law of mass action • Le Chatelier's principle • Reaction isotherm and reaction isochore • Clapeyron equation and Clausius-Clapeyron equation • Applications • Conclusion of the Unit
5.	**Ionic Equilibrium**
	• Introduction of the Unit • **Ionic Equilibrium:** Strong, moderate and weak electrolytes • degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water • Ionization of weak acids and bases, pH scale, common ion effect • Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts, Buffer solutions • Solubility and solubility product of sparingly soluble salts – applications of solubility product principle • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Physical Chemistry	Castellan, G.W.	4th Ed.	Narosa (2004).
2.	Physical Chemistry	Barrow, G.M.	latest	Tata McGraw-Hill (2007).

Code: BESCES3104	WEB DEVELOPMENT	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOME:

CO1: Explain the history of the internet and related internet concepts that are vital inunderstanding web development.

CO2: Discuss the insights of internet programming and implement complete application overthe web.

CO3: Demonstrate the important HTML tags for designing static pages and separate design fromcontent using Cascading Style sheet.

CO4: Utilize the concepts of JavaScript and Java.

CO5: Use web application development software tools i.e., Ajax, PHP and XML etc. and identifythe environments currently available on the market to design web sites.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction to the Internet and the World Wide Web**	8
2.	**HTML & CSS**	8
3.	**XML and HTML5, CSS3**	8
4.	**PHP Server Side Scripting**	6
5.	**Practical Website Development**	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to the Internet and the World Wide Web**
	• Introduction of the Unit • History of internet, Internet Design Principles, Internet Protocols - FTP, TCP/IP,SMTP, Telnet, etc., Client Server Communication, Web System architecture • Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and back end web development. • HTML, CSS, JS, XML; HTTP, secure HTTP, etc; URL, Web Services – SOAP, REST • Conclusion of the Unit
2.	**HTML & CSS**
	• Introduction of the Unit • Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; • More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button, Images. • Introduction to CSS, Syntax, Selectors ,Embedding CSS to Html, Formatting fonts, Text & background colour, Inline styles, External and Internal Style Sheets, Borders & boxing • Conclusion of the Unit
3.	**XML and HTML5, CSS3**
	• Introduction of the Unit • Introduction to XML, Difference b/w Html & XML, XML editors, XML Elements & Attributes XML DTD, XML Schema, XML Parser, Document Object Model (DOM), XML DOM. • Introduction to HTML5, CSS3, New features, Local storage, Web Sockets, Server events, Canvas,

	Audio & Video, Geolocation, Microdata, Drag and Drop. Browser life cycle and browser rendering stages. Service workers
4.	**PHP Server Side Scripting**
	• Introduction of the Unit • Introduction to PHP, Basic Syntax, Variables, constants and operators, Loops, Arrays Strings, • Environment & environment variables, responding to HTTP requests, Files, Cookies, Sessions, Examples. • Conclusion of the Unit
5	**Practical Website Development**
	• Introduction of the Unit • Commonly used Web Servers and browsers, Setting up a server and domain name, website types and structures, • Web authoring tools, Web hosting, website maintenance, generating traffic to your website. • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Publication
1.	Practical Web Design for Absolute Beginners	Adrian W. West	Apress 2016
2.	Introducing Web Development	Jorg Krause	Apress 2017
3.	HTML & CSS: The Complete Reference	Thomas Powell	McGraw Hill, Fifth Edition, 2010
4.	Creating a Website: The Missing Manual	Mathew Macdonald. O'Reilly	3rd Edition

Code: BESCES3201 ENVIRONMENTAL SCIENCE LAB-III 1.0Credit [LTP: 0-0-2]

COURSE OUTCOMES: Students would be able to:
CO1: Learn and apply basic techniques used for air, water and soil pollution analysis.CO201.2: Select spectroscopic methods for measurement of pollution in air and water.
CO3: Assess the Particulate Matter in air through laboratory experiment.
CO4: Elucidate Non-respirable and respirable dust in air
CO5: Acquire the ability to understand, explain and use instrumental techniques for pollution analysis.

LIST OF EXPERIMENTS

1.	Measurement of Noise using Sound Level Meter (Field Practical).
2.	Determination of Particulate Matter (PM10) in ambient air (Gravimetric Method)
3.	Determination of PM2.5 in ambient air (Gravimetric Method)
4.	Analysis of sulphur dioxide in ambient air (ImporvedWestandGaeke Method)
5.	Analysis of Nitrogen dioxide in ambient air (Modified Jacob and Hochheiser Method)
6.	Analysis protocol for ozone in ambient air (Chemical Method)
7.	Analysis protocol for ammonia in ambient air (Indophenol Method)
8.	Analysis of Lead in ambient air (Atomic Absorption Spectrophotometer Method)
9.	Determination of Iron and Manganese in Water
10.	Determination of B.O.D. of Wastewater Sample
11.	Determination of COD in Water
12.	Determination of Fluoride in Water

Code: BESCES3202	CHEMISTRY LAB-III	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES: Students would be able to:

CO1: Understand chemical and molecular processes that take place in inorganic chemicalreactions in synthesis.

CO2: Analyze and present experimental results and draw sound conclusions based on experimental evidence.

CO3: Acquire the ability to understand, explain and use instrumental techniques for chemicalanalysis

CO4 Applying subject knowledge and skill to solve complex problems with defined solutionsCO5: Understand the different factors that contribute to the adsorption.

LIST OF EXPERIMENTS

Inorganic Chemistry	
1	Preparation of sodium trioxalatoferrate(III).
2	Estimation of Mg2+ and Zn2+ using complexometric titration
3	Preparation of copper tetraammine complex.
4	Preparation of cis- Potassium dioxalatodiaquachromate(III).
5	Preparation of Trans- Potassium dioxalatodiaquachromate(III).
6	Colorimetric determination of metal ions (Iron).
Physical Chemistry	
7	To determine the relative strength of two acids(HCl& H_2SO_4)
8	To verify Beer Lamberts law $KMnO_4$/$K_2Cr_2O_7$ and determine the concentration of the given solution.
9	Estimation of Fe(II) and oxalic acid using standardized KMnO4 solution
10	To titrate potentiometrically the given ferrous ammonium sulphate solution using $K_2Cr_2O_7$ and calculate the redox potential of Fe^{+2}/Fe^{+3} system
11	To determine the dissociation constant of a weak acid Conductometrically and verify ostwalds dilution law.
12	Adsorption of acetic acid on charcoal

Code: BESCES3203 WEB DEVELOPMENT LAB-III 1.0 Credits [LTP: 0-0-2]

COURSE OUTCOME: Student would be able to:

CO1: Explain the history of the internet and related internet concepts that are vital in understanding web development.

CO2: Discuss the insights of internet programming and implement complete application over the web.

CO3: Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet.

CO4: Utilize the concepts of JavaScript and Java

CO5: Use web application development software tools i.e.Ajax, PHP and XML etc. and identify the environments currently available on the market to design web sites.

LIST OF EXPERIMENTS:

Part A	
	1. 1. Hello World Web Page a) Create a web page using basic HTML features like tags, attributes, elements and page title. b) How to install, and configure a web server 2. Create a My Profile Page a) A more functional web page by making use of headings, paragraphs, lists, images and links. b) Design a web page using CSS include the following: i. Use different font styles. ii. Set background image for both the page and single elements on the page. 3. Create a My Profile Page a) Using textboxes, check boxes, radio buttons and submit buttons. b) Design a web page using CSS include the following: i. Control the repetition of image with background-repeat property. ii. Define style for links as a: link, b: active, c: hover, d: visited. iii. Add customized cursors for links. 4. Create XMLHttpRequest and retrieve data from a text file and an XML file. 5. Create the following webpage: a) Show the class timetable in a tabular format. b) Create a webpage using HTML to show your geolocation. 6. Create a webpage using HTML for audio and video player.
Part B	
	7. Create a login registration form using PHP. 8. Develop a PHP webpage to manipulating files such as creating, writing, reading and uploading. 9. Create a dynamic webpage by using PHP conditional operators, loops and strings to create an dynamic timetable page. 10. Develop a PHP web application track the user as how many times visited and last visited time 11. Develop a static website – I. 12. Develop a dynamic website –II

Code: BESEES3101	BIODIVERSITY AND WILDLIFE	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Point out the definition, types and importance of biodiversity and introduce to heritage, hotspots,and hope spots of biodiversity in India, like Ramsar sites.

CO2: Point out the extinction of species, methods of conservation of biodiversity and national parks,sanctuaries and biosphere reserves.

CO3: Introduce to wildlife in historical perspective and wildlife habitats.

CO4: Point out conservation projects, red data book and practice exercise of wild life in RajasthanCO5: Introduce to different laws enacted for wildlife and biodiversity

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Introduction to Biodiversity**	5
2.	**Biodiversity Conservation**	8
3.	**Introduction to Wildlife**	8
4.	**Wildlife Management and Conservation**	8
5.	**Laws Enacted for Wildlife and Biodiversity**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Biodiversity**
	• Introduction of Unit • Definition and Types – Genetic, Species and Ecosystem Diversity(α, β and γ) • Importance - ecological, consumptive, productive, social, ethical and aesthetic • Key Biodiversity areas; Biodiversity heritage sites • Hotspots and hope spots in India • Introduction to Ramsar convention, Ramsar sites in India • Conclusion and real life application
2.	**Biodiversity Conservation**
	• Introduction of Unit • Causes of loss of Biodiversity • Extinction of species –causes; examples of extinct species in India • Methods of Conservation (*in situ* and *ex situ*) • Protected areas-National parks ,sanctuaries and biosphere reserves, community andconservation reserves • Role of biotechnology in biodiversity conservation • Conclusion and real life application
3.	**Introduction to Wildlife**
	• Introduction of Unit • Historical perspective, positive and negative values of wildlife • Wildlife habitats-Ecozones and faunal diversity • Causes of wildlife depletion • Conclusion and real life application
4.	**Wildlife Management and conservation**
	• Introduction of Unit • Conservation projects- Project Tiger, Lion, Elephant, Rhino, Hoolock gibbon • Red Data Book and categories to evaluate-Extinct, Extinct in the wild, Criticallyendangerd, Endangered, Vulnerable, Near Threatened, least concerned,

	Data deficient • Conclusion and real life application
	and not Evaluated • Wild life in Rajasthan- Names and location of National Parks, tiger reserves andmajor sanctuaries • Conclusion and real life application
5.	**Laws Enacted for Wildlife and Biodiversity**
	Salient features of- • Wildlife (Protection) Act,1972 • Convention on Biological Diversity (CBD) • Man And Biosphere (MAB) program me • Conclusion and real life application

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Global Environmental Negotiations I: Green Politics	Agarwal, A. Narain, S. and Sharma, A.	1999	New Delhi: Centre for Science and Environment
2.	The Biodiversity of India.	Bharucha, E.		Ahmedabad: Mapin Publishing Pvt. Ltd.
3.	A Guide to the Convention on Biological Diversity	Glowka, L. Guilmin, F. B. and Synge, H.	1994	IUCN Gland Switzerland and Cambridge, UK
4.	Global Biodiversity.Status of the earth's Living Resources.	Groombridge, B.	1992	London, UK: WCMC.
5.	Encyclopedia of Indian Natural History	Hawkins, R. E.	1987	Bombay Natural History Society:OUP India
6.	Global Biodiversity Assessment.	Heywood, V. H. and Waston, R.T.	1995	Cambridge: Univ. Press.
7.	Understanding Biodiversity	Kothari, A.	1997	New Delhi: Orient Longman.
8.	Wildlife Conservation and Management.	Mathur, R.	2014	Meerut: Rastogi Publications

Code: BESEES3102 ENVIRONMENT MANAGEMENT 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Analyze the Energy Auditing Techniques, methods of conducting energy audit and energy audit report.

CO2: Apply the concept of Basic Electrical Systems, Bill Analysis, Lighting Systems and Transformers and Electric Distribution

CO3: Study of Electric Motors with Motor characteristic, Motor Efficiency, losses in induction motors, factor affecting motor performance. And Compressed Air Systems

CO4: Understand Environment pollution, global warming and climate change: Air pollution (local, regional and global); Water pollution problems; Land pollution and food chain contaminations.

CO5: Create the chart natural resources, Agricultural, industrial systems and environment, Energy technologies and environment.

A. **OUTLINE OF THECOURSE:**

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Energy Auditing Techniques**	5
2.	**Basic Electrical Systems**	8
3.	**Electric Motors: ECO**	8
4.	**Environment Pollution, Global Warming and Climate**	8
5.	**Energy Technologies and Environment**	7

B. DETAILED SYLLABUS:

Unit	Unit Details
1.	**Energy Auditing Techniques**
	• Introduction of Unit • Energy Auditing Techniques: Definition, Energy audit-need, Types of energy audit, Energy management (audit) approach- understanding energy costs, Bench marking, Energy performance, Matching energy use to Requirement, Maximizing system efficiencies, optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments. , • Methodologies of Conducting Energy Audit: Preliminary & Detailed Energy Audit Methodology: Preliminary Questionnaire, Review of Previous Records, Introductory Meeting, Walk through Tour, Flow Chart Construction for Detail Energy Audit, Identification of Required Audit Instruments, Finalization of Audit Schedule with the Company, Getting Detailed Data. • Energy Audit Report: Outlines of Energy Audit Report Format Identification and Techno economic • Analysis of Energy Conservation Measures, Classification of Energy Conservation Measures • Conclusion and Summary of Unit
2.	**Basic Electrical Systems**
	• Introduction of Unit • Basic Electrical Systems: Basis of Energy and its various forms: Electrical Basis-DC & AC, currents active power, reactive power and apparent power, star, delta connection. • Bill Analysis: ECO (Energy Conservation Opportunities) Electricity tariff and components, load Management & Demand Side Control, power factor improvement & its benefit, selection and location of capacitors, Performance Assessment of capacitors & Capacitor Bank. • Lighting Systems: Light source, Choice of Lighting, Luminance requirements, Energy conservation avenues. • Transformers and Electric Distribution: Types of transformers, Transformer losses, Energy efficient transformers, Factor affecting the performance of transformers and Energy Conservation Opportunities, Cables, Switch Gears, Distribution Losses, and energy conservation opportunities in-house electrical distribution system. • Conclusion and Summary of Unit

3.	**Electric Motors: ECO**
	• Introduction of Unit • Electric Motors: ECO Introduction, Types, Motor characteristic, Motor Efficiency, losses in induction motors, factor affecting motor performance, Motor Load Survey: Methodology, Rewinding motor and replacement issues, Energy Saving Opportunities in Motors, Motor Selection, Energy Efficient Motors, Speed Control of AC Induction Motors, Soft starter with energy savers, Variable Speed Drives (VFD). • Compressed Air Systems: ECO Introduction, Types of air compressors, compressor efficiency, efficient compressor operation, compressed air systems components, capacity assessment, and leakage test, factors affecting the performance and Efficiency, energy savings opportunities. • Conclusion and Summary of Unit
4	**Environment pollution, global warming and climate change**
	• Introduction of Unit • Environment pollution, global warming and climate change: Air pollution (local, regional and global); Water pollution problems; Land pollution and food chain contaminations; Carbon cycle, greenhouse gases and global warming; Climate change–causes and consequences; Carbon footprint; Management of greenhouse gases at the source and at the sinks Ecology, • Structureandfunctioningofnaturalecosystems:Ecology,ecosystemsandtheirstructure,functioninganddynamics; Energy flow in ecosystems; Biogeochemical cycles and climate; Population and communities • Conclusion and Summary of Unit
5.	**Energy technologies and environment**
	• Introduction of Unit • Natural resources: Human settlements and resource consumption; Biological, mineral and energy resources; Land, water and air; Natural resources vis-à-vishuman resources and technological resources; Concept of sustainability; Sustainable use of natural resources • Agricultural, industrial systems and environment: Agricultural and industrial systems visà-vis natural eco systems; Agricultural systems, and environment and natural resources; Industrial systems and environment • Energy technologies and environment: Electrical energy and steam energy; Fossil fuels, hydro power and nuclear energy; Solar energy, wind energy and biofuels; Wave, ocean thermal, tidal energy and ocean currents; Geothermal energy; Future energy sources; Hydrogen fuels; Sustainable energy • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Bharucha, E., Textbook of Environmental Studies	Bharucha	2nd	Universities Press
2.	Ecology-Principles and Application	Chapman, J.L. and Reiss, M.J	1st	Cambridge University Press(I.P.E)
3.	Environmental Studies	Joseph,B	1st	TataMc Graw-Hill
4.	D.R.Energy Efficiency for Engineers and Technologists	Eastop, T.P. andCroft	2nd	Longman and Harow
5.	Environmental Science	Miller ,G.T	2nd	Thomson
6.	Energy Management	O'Callagan	3rd	Mc Graw Hill Book Co. Ltd
7.	Generation Of Electrical Energy Edition 2005	B.R. Gupta	1st	Eurasia Publishing House(PVT.) LTD.

Code: BULCHU3201 COMMUNICATION SKILLS-I 1Credit [LTP: 0-0-2]

COURSE OUTCOMES: Students would be able to:

CO1: Demonstrate depth of understanding, observing complexity, improve insight and develop independent thought and persuasiveness.

CO2: Determine the main ideas of the text by using key details and compare & contrast the most important points with the help of their perspective.

CO3: Practice the qualities of writing style by applying the concepts of sentence conciseness, accuracy, readability, coherence and by avoiding wordiness or ambiguity.

CO4: Distinguish words and phrases as per their intonation patterns and interpret the audios based on different situations

CO5: Demonstrate the understanding of impactful conversational skills, presentation skills & telephonic conversation by considering the need of the audience.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Intrapersonal/Interpersonal Skills**	**8**
2	**Reading Skills**	**2**
3	**Writing Skills**	**4**
4	**Listening Skills**	**2**
5.	**Speaking Skills**	**8**

B. DETAILED SYLLABUS

LIST OF LABS	
1.	Self – Awareness & Self-Introduction
2.	Goal Setting: Ambition induced, interest induced or environment conditioned
3.	Cultivating Conversational Skills
4.	Role Plays : Selection of varied plots, characters & settings
5.	Reading skills I: Newspaper Reading & General Article Reading
6.	Writing Skills I: Story Making by jumbled words
7.	Understanding and Applying Vocabulary
8.	Listening Skills I: Types and practice by analyzing situational listening
9.	Speaking Skills I: JAM
10.	PowerPoint Presentation Skills-I
11.	Telephonic Etiquettes and Communication
12.	Recognizing, understanding and applying communication style (Verbal/Non-Verbal)

Code: BESCES3601	Talent Enrichment Programme (TEP-III)	1 Credit

OVERVIEW AND OBJECTIVES The objective of Discipline and TEP is to provide students with the opportunities to enhance job-fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University.

TEP is integrated into the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories.

Discipline and Talent Enrichment Programme (TEP) shall be evaluated irrespective of period/time allocation (as in the case of Extra Curricular activity) in the teaching scheme as 1 credit course. The record related to discipline, related activities are maintained for each student, and they shall be evaluated for the same. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of these classes shall be recorded and accounted in the total attendance.

Code: BESCES4101 ENVIRONMENTAL POLLUTION AND CONTROL-II 3.0Credits [LTP: 3-0-0]

COURSE OUTCOME: The student would be able to:

CO1: Point out types, sources, effects and control of soil pollution.

CO2: Explore the nature and types of radiation pollution and their effects on environment andhuman health.

CO3: Explore the nature and types of thermal pollution and their effects on environment andhuman health.

CO4: Evaluate information about the Sewage composition and different types of anaerobictreatment System.

CO5: Point out the different types of aerobic sewage treatment systems

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Soil/Land pollution and its control**	8
2.	**Radiation pollution and its control**	7
3.	**Thermal pollution and its control**	7
4.	**Bound State Problems**	7
5.	**Simple Harmonic Oscillator (1-D Case)**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Soil/Land pollution and its control**
	• Introduction of Unit • Major sources of soil pollution • Types and effects of soil pollutants (domestic and municipal waste, industrial and miningwaste, agricultural waste, radioactive and chemical waste) • Control of soil pollution • Conclusion and real life application
2.	**Radiation pollution and its control**
	• Introduction of Unit • Major sources of radiation pollution • Effects of radiation pollution • Conclusion and real life application
3.	**Thermal pollution and its control**
	• Introduction of Unit • Sources and effects of thermal pollution • Control of radiation and thermal pollution • Conclusion and real life application
4.	**Sewage & its Treatment -I**
	• Introduction of Unit • Sewage composition and characteristics • Primary treatment, secondary treatment & tertiary treatment • Anaerobic Treatment System: Upflow anaerobic sludge blanket reactor (UASB), Anaerobicfluidized bed reactor (AFB)

	• Conclusion and real life application
5.	**Sewage & its Treatment-II**
	• Introduction of Unit • Aerobic Treatment Systems: ▪ Activated sludge process ▪ Trickling filters ▪ Rotating biological contactors ▪ Moving Bed Biofilm Reactor MBBR • Sequencing batch reactor(SBR) • Conclusion and real life application

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Living In The Environment	Miller, T.G., S. E.	2012	Usa: Brooks/Cole Cenage Learning
2.	Environmental And Pollution Science	Pepper, I., C. P.	2006	Academic Press
3.	Environmental Pollution And Control	Pierce, J., R. E.	1998	Usa: Butterworth-Heinemann (Elsevier)
4.	Environmental Chemistry	Kaur, H.	2014	Meerut: PragatiPrakashan
5.	Air Pollution	Rao, M.N., H. R.	1989	New Delhi: Tata Mcgraw Hill Publishing Company Limited
6.	Environmental Science: A Global Concern	Cunningham, W. P., & Cunningham, M. A.	2012	The McGraw-Hill Companies, Inc.

Code: BESCES4102	INORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Demonstrate different Acid Base theories and Solvent system concept.

CO2: Analyze metal ligand bonding in transition metal complexes with the help of Valence Bond Theory and Crystal field Theory.

CO3: Outline magnetic &spectral properties, thermodynamic and kinetic aspects of metal complexes.

CO4: Summarize synthesis, properties and applications of organometallic compounds.

CO5: Evaluate redox potential, redox cycle and disproportionation using Frost, Latemar and Roubaix diagram.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Acids & Bases and Non-aqueous Solvents**	8
2.	**Metal Ligand Bonding in Transition Metal Complexes**	7
3.	**Magnetic and Spectral Properties of Transition Metal Complexes**	7
4.	**Organometallic Chemistry**	8
5.	**Oxidation & Reduction**	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Acids & Bases and Non-aqueous Solvents**
	• Introduction of the Unit • **Acids and bases:** Theories ofArrhenius, Bronsted-Lowry, Lux-Flood • Solvent system concept and Lewis concept 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 • **Non-aqueous solvents :**Physical properties of solvent, types of solvent and their general characteristics • reactions in non-aqueous solventswith reference to liq. NH_3 and liq. SO_2, HF • Conclusion of the Unit
2.	**Metal Ligand Bonding in Transition Metal Complexes**
	• Introduction of the Unit • **Transition Metals:** Characteristic properties transition elements – ionic radii, oxidation states, complexationtendency, magnetic behavior and electronic spectral properties. • Metal ligands bonding in transition metal complexes • Limatation of VBT, Elementary idea of CFT, Crystal field splitting in Octahederal ,Tetrahederal and Square planercomplexes ,Factors affecting the crystal field parameter • Conclusion of the Unit
3.	**Magnetic and Spectral Properties of Transition Metal Complexes**
	• Introduction of the Unit • **Magnetic Properties of Transition Metal Complexes:**Types of magnetic behavior, methods of determining magnetic susceptibility, L-S and J-J coupling, orbital contribution to magnetic moments. Correlation of magnetic moment data and stereochemistry of Co (II) and Ni (II) complexes; anomalous magnetic moments **Spectral properties of transition metal complexes:** Types of electronic transitions, selection

	rules for d-d transitions, spectroscopic ground states and Spectoscopic terms (L-S Coupling) , spectrochemical series, orgel energy level diagram for d^1 and d^9 states, the electronic spectrum of [$Ti(H_2O)_6]^{+3}$ complex ion. • Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metalcomplexes and factors affecting the stability, substitution reactions of square planar complexes • Conclusion of the Unit
4.	**Organometallic Chemistry**
	• Introduction of the Unit • **Organometallic chemistry:** Definition, nomenclature and classification of organometallic compounds, • Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti, a brief account of metal – ethylenic complexes and homogenous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls. • Conclusion of the Unit
5.	**Oxidation & Reduction**
	• Introduction of the Unit • Use of Redox potential data • Analysis of redox cycle • Redox stability in water • Disproportnation • Diagrammatical presentation of potential data-Frost, Latimar and pourbaix diagram • Principle involved in the extraction of elements • Conclusion of the Unit

A. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Selected Topics in Inorganic Chemistry	Malik Tuli,Madan	Latest	S. Chand & Sons
2.	Advanced Inorganic Chemistry	S. K Agarwal, Keemtil	Latest	Pragati Prakashan

Code: BESCES4103	ORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Describe the nomenclature, structure, bonding and characteristic reactions of Phenols and Ethers

CO2: Analyze chemical behavior of aldehyde and ketones and discuss name reactions of synthesis.

CO3: Explain physical and chemical properties of Carboxylic acids.

CO4: Compare physical and chemical properties of carboxylic acid derivatives.

CO5: Discuss chemical behavior and nucleophilic substitution reactions of amines and diazonium salts.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Phenols and Ethers**	8
2.	**Aldehydes and Ketones**	7
3.	**Carboxylic Acids**	7
4.	**Carboxylic Acid Derivatives**	7
5.	**Amines and Diazonium Salts**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Phenols and Ethers**
	• Introduction of the Unit. • **Phenols:** (Phenol case) Nomenclature, Structure and Bonding, Preparation*:* Cumenehydroperoxide method, from diazonium salts. • Physical Properties and acidic character**.** Comparative acidic Strengths of Alcohols and Phenols.resonance stabilization of phenoxide ion. • Reactions*:* Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer- Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction, Fries Rearrangement,Claisen Rearrangement, Lederer- Manasse Reaction • **Ethers (aliphatic and aromatic):** Cleavage of ethers with HI. • Nomenclature of Ethers, Method of Formation, Chemical Reactions – Cleavage and autooxidation, Ziesel's Method. • Synthesis of epoxide, Acid and base-catalyzed ring opening of Epoxide , orientation of epoxide, reactions of Grignard and organolithium reagents with epoxides • Conclusion of the Unit
2	**Aldehydes and Ketones**
	• Introduction of the Unit. • Nomenclature and Structure of Carbonyl Group. • **Aldehydes and ketones (aliphatic and aromatic):** (Formaldehye, acetaldehyde, acetone and benzaldehyde) • Preparation: from acid chlorides and from nitriles. • Reactions – Reaction with HCN, ROH, $NaHSO_3$, NH2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner

	reduction. Meerwein-PondorffVerley reduction, Perkin and KnoevenAgel Condensation, Mannich Reaction. • synthesis of aldehydes and ketones using 1,3-dithianes. syntheses of ketones from carboxylic acids, Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV (Meervein-Pondrof-Verley), Clemmensen, Wolff-Kishner, LiAIH4 and NaBH4 reductions, Use of acetals and 1,3-dithiane as protecting group. • Conclusion of the Unit
3	**Carboxylic acids**
	• Introduction of the Unit. • **Carboxylic acids** (aliphatic and aromatic), Nomenclature. • Carboxylic Acids Structure and bonding, physical properties. acidity of carboxylic acids, effects of substituents on acid strength., mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxy acids - malic, tartaric and citric acids. • *Reactions:* Hell – Vohlard–Zelinsky, reaction, Synthesis of acid chlorides, esters, amides**,** • *Preparation:* Acidic and Alkaline hydrolysis of esters. • Methods of Formation of alpha, beta unsaturated monocarboxylic acid. • Dicarboxylic acid- Method Formation and effect of heat and dehydrating agents, succinic, glutaric acid andadipic acid. • Conclusion of the Unit
4	**Carboxylic acid derivatives**
	• Introduction of the Unit. • **Carboxylic acid derivatives (aliphatic):** (Upto 5 carbons) • *Preparation:* Acid chlorides, Anhydrides, Esters and Amides from acids and theirinterconversion. • *Reactions:* Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation. • Carboxylic Acid Derivatives : nomenclature Relative stability of acyl derivatives.. Preparation of carboxylic acid derivatives. chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic • Conclusion of the Unit
5	**Amines and Diazonium Salts**
	• Introduction of the Unit. • Preparation of nitroalkanes and nitroarencs. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarcncs and their reductions in acidic, neutral and alkaline media. Picric acid.seperation of $1^{0,}$ 2^{0} ,3^{0}. • **Amines:** Amines (Aliphatic and Aromatic): (Upto 5 carbons) • *Preparation*: from alkyl halides, Gabriel's Phthalimide synthesis, HofmannBromamide reaction. • *Reactions:* Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO_2, Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation • *Reactions:* conversion to benzene, phenol, dyes • Amines: Structure. nomenclature and preparation of alkyl, and aryl amines (reduction of nitro compounds. nitrites), reductive amination of aldehydic and ketonic compounds.. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Hoffmann brormamide reaction with mechanism. Diazotisation and mechanism. transformations of aryl diazonium salts, azo coupling and its applications • **Diazonium salts**: *Preparation:* from aromatic amines • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	Organic Chemistry	Morrison and Boyd	Latest	Prentice Hall
2.	Organic Reaction and Their Mechanisms	P. S. Kalsi	Latest	New Age Science
3.	Organic Chemistry	P. L. Soni	Latest	S. Chand & Sons

Code: BESCES4104 DATABASE MANAGEMENT SYSTEMS 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Students would be able to:

CO1: Evaluate business information problem and find the requirements of a problem in terms of data.
CO2: Understand the uses the database schema and need for normalization.
CO3: Design the database schema with the use of appropriate data types for storage of data in database.
CO4: Use different types of physical implementation of database

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction of Database Management System**	**8**
2.	**E-R Model**	**5**
3.	**Relational Model**	**6**
4.	**Database Design**	**8**
5.	**SQL**	**9**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction of Database Management System**
	• Introduction of the unit • Introductory concepts of DBMS : Introduction and applications of DBMS • Purpose of data base, Data,Independence, Database System architecture- levels • Mappings, Database, users and DBA • Conclusion and real life application
2.	**E-R Model**
	• Introduction of the unit • Entity-Relationship model : Basic concepts, Design process, constraints, Keys • Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization • Specialization, aggregation, reduction to E-R database schema Conclusion and real life application • Conclusion and real life application
3.	**Relational Model**
	• Introduction of the unit • Relational Model : Structure of relational databases, Domains, Relations • Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus SQL Concepts : Basics of SQL, DDL,DML,DCL, structure – creation, alteration • Defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date • String functions, set operations, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. transaction control commands – Commit, Rollback, Savepoint, Conclusion and real life application • Conclusion and real life application
4.	Database Design
	• Introduction of the unit • Relational Database design : Functional Dependency – definition, trivial and non-trivial FD

	• Closure of FD set,closure of attributes, irreducible set of FD, Normalization – 1Nf, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF • Multivalued dependency, 4NF, Join dependency and 5NF, Conclusion and real life application • Conclusion and real life application
5.	**SQL**
	• Introduction of the unit • SQL queries programming and Triggers: The Forms of a Basic SQL Query • Union, and Intersection and Except, Nested Queries, Correlated Nested Queries • Set-Comparison Operations, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases • Conclusion and real life application

C. RECOMMENDED STUDY MATERIAL:

S.No	Reference Book	Author	Edition	Publication
1.	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudharshan	5th	McGraw-Hill Higher Education
2.	An Introduction to Database Systems	BipinCDesai	Latest	Galgotia Publications
3.	Fundamentals of database Systems	Elmasri,Navathe	3rd	Addison Wesley
4.	A First Course in Database Systems	Jefrey D.Ulman,Jenifer Widom	Latest	Pearson Education Asia
5.	Modern Database Management	Fred R McFadden, Jeffery A Hoffer,Mary B. Prescott	5th	Addison Wesley

Code: BESCES4201 ENVIRONMENTAL SCIENCE LAB-IV 1.0 Credits [LTP: 0-0-2]

COURSE OUTCOMES: Students would be able to:
CO1: Have an idea of purification technique of water quality parameters.
CO2: Recognize the basic practical skills for the estimation of CO_2, O^2 in the drinking water.CO3: Purify and separate impurities with special techniques.
CO4: Analyze and present experimental results and draw sound conclusions based on experimental evidence.
CO5: Exposed to the different processes used in water purification.

LIST OF EXPERIMENTS

1	Determination of Free CO_2 in the water sample
2	Determination of Dissolved oxygen in the water sample
3	Determination of C.O.D. of water Sample
4	Determination of B.O.D. of water Sample
5	Determine the Ammonical Nitrogen in water sample
6	Determination of the optimum dosage of coagulant requirement of waste water sample
7	Determination of Available Chlorine in Bleaching Powder
8	Estimation of Sulphate in water sample
9	Qualitative estimation of Nitratein water sample
10	Qualitative estimation of Phosphatein water sample
11	Determination of Iron and Manganese in Water
12	Determination of total solids, settable solids and suspended solids.

Code: BESCES4202	CHEMISTRY LAB-IV	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES: Students would be able to:
CO1: Have an idea of estimation technique of various ions present in a mixture.
CO2: Recognize the basic practical skills for the synthesis and analysis of organic compounds.
CO3: Purify and separate compounds with special techniques.
CO4: Analyze and present experimental results and draw sound conclusions based on experimental evidence.
CO5: Exposed to the different processes used in industries and their applications

LIST OF EXPERIMENTS

Inorganic Chemistry	
1	Estimation of sodium carbonate and sodium hydroxide present in a mixture.
2	Estimation of acetic acid in commercial vinegar using NaOH
3	Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$.
4	Estimation of Ferrous and Ferric by dichromate method
5	Estimation of Cu as copper thiocyanate
6	Preparation of Ni- DMG complex
Organic Chemistry	
7	To separate and identify the organic mixture containing two solid components using water and prepare their suitable derivatives.
8	To separate and identify the organic mixture containing two solid components using NaOH.
9	To prepare Iodoform from ethanol and acetone
10	Estimation of glucose by Fehling's solution.
11	Isolation of caffeine from tea leaves.
12	Synthesis of methyl orange

Code: BESCES4203	DBMS LAB-IV	1.0Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Student would be able to:

CO1: Use a desktop database package to create, populate, maintain, and query a database.

CO2: Use an SQL interface of a multi-user relational DBMS package to create, secure,populate, maintain, and query a database.

CO3: Formulate query, using SQL, solutions to a broad range of query and data updateproblems.

CO4: Analyze an information storage problem and derive an information model expressed in the form

CO5: Execute various advance SQL queries related to Transaction Processing & Locking using concept of Concurrency control.

LIST OF EXPERIMENTS:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER, UPDATE and DELETE.
4. Write the queries to implement the joins.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT ().
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion, updation and deletion
10. Write the query for creating the users and their role Query multiple tables using JOIN operation.
11. Grouping the result of query - GROUP BY clause and HAVING clause
12. Query multiple tables using NATURAL and OUTER JOIN operation.

Code: BESEES4101	SOFTWARE ENGINEERING	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOME:

Students would be able to:
CO1: Plan a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
CO2: elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
CO3: Analyze and translate a specification into a design
CO4: Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice
CO5: use modern engineering tools necessary for software project management, time management and software reuse.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Group	9
2	Subgroup	6
3	Group Morphism	6
4	Rings and Sub-rings	8
5	Fields	7

B DETAILED SYLLABUS

Unit	Unit details
1	**Group**
	• Introduction of the Unit. • Binary operation, Algebraic Structure, Groups, • Abelian Group, Cyclic Group, order of element, • Generator of Cyclic Group, Cyclic permutation • Conclusion of the Unit
2	**Subgroup**
	• Introduction of the Unit. • Subgroup, center of a group, • Group Zn of integers under addition modulo n and the • Group U(n) of units under multiplication modulo n, • Cosets, Lagrange's theorem • Conclusion of the Unit
3	**Group Morphism**
	• Introduction of the Unit. • Morphism of groups, Cayley's theorem • Normal subgroups and Quotient groups • Fundamental theorem of Isomorphism. • Conclusion of the Unit
4	**Rings and Sub-rings**
	• Introduction of the Unit. • Definition and simple properties of rings • Commutative and non-commutative rings • Sub-rings, Morphism of Rings • Embedding of a Ring • Conclusion of the Unit
5	**Fields**

	• Introduction of the Unit. • Integral domains and Fields • Characteristics of a Ring and Field • Prime fields • Definition of Vector Spaces • Conclusion of the Unit

C RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Elements of Abstract Algebra	B. K. C. Sarangi	**2016**	RBD, Jaipur
2	Abstract Algebra	M. Artin	2nd Ed	Pearson, 2011
3	A First Course in Abstract Algebra	John B. Fraleigh	7th Ed	Pearson,India 2002

Code: BESEES4102 RENEWABLE AND ALTERNATE ENERGY 3.0 Credits [LTP: 3-0-0]

COURSEOUTCOMES: Students would be able-

CO1 – To study the Need, importance and scope of non-conventional and alternate energy resources.
CO2 - To develop significance solar energy Applications
CO3 - To define Wind Energy Conversion System
CO4 - To understand the role of ocean energy in the Energy Generation.
CO5 - To develop Biogas plants and geothermal energy

A. OUTLINE OF THECOURSE

Unit No.	Title of the Unit	Time required for the Unit(Hours)
1.	Solar Energy	7
2.	Wind Energy	9
3.	Ocean Energy	10
4.	Bio-Mass	9
5.	Geothermal Energy & Energy Conservation	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**SOLAR ENERGY**
	• Introduction of Unit • Solar Radiation, Measurements of Solar Radiation, Flat Plate And Concentrating Collectors, Solar Direct Thermal Applications, Solar Thermal Power Generation, Fundamentals of Solar Photo Voltaic Conversion, Solar Cells, Solar PV Power Generation, Solar PV Applications.. • Conclusion and Summary of Unit
2.	**WINDENERGY**
	• Introduction of Unit • Wind Energy Estimation, Types of Wind Energy Systems, Performance, Site Selection, Details of Wind Turbine Generator. • Conclusion and Summary of Unit
3.	**OCEAN ENERGY**
	• Introduction of Unit • Ocean Thermal Energy Conversion (OTEC), Principle of operation, development of OTEC plants, Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants. • Conclusion and Summary of Unit
4.	**BIO-MASS**

	• Introduction of Unit • Principles of Bio-Conversion, Anaerobic/aerobic digestion, • Types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking. • Conclusion and Summary of Unit
5.	**GEOTHERMALENERGY&ENERGYCONSERVATION**
	• Introduction of Unit • Resources, types of wells, methods of harnessing the energy, scope in India. Principles of energy conservation, • Different energy conservation appliances, cooking stoves, Benefits of improved cooking stoves over the traditional cooking stoves • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Expert Handbook for Planning, Design and Installation	NA	NA	Earthscan Ltd
2	Solar Water and Pool Heating Manual	NA	NA	Florida Solar
3	Planning and Installing Solar Thermal Systems: A Guide for Installers, Architects and Engineers	NA	NA	Kindlee Book

Code: BULCHU4201	COMMUNICATION SKILLS-II	1 Credit [LTP: 0-0-2]

COURSEOUTCOMES: Students would be able to:

CO1: Develop the ability to identify difficult sounds, words and phrases to strengthen listening and applying these improved skills in spoken communication.

CO2: Cultivating knack for reading and writing by understanding the nuances of sentence structure and presentation style.

CO3: Understand negotiation and Identify steps for proper negotiation preparation & learn bargaining techniques and strategies of inventing options for mutual gain and move negotiations from bargaining to closing.

CO4: Develop a heightened awareness of the potential of digital communication and apply their knowledge in creating documents considering the needs of the netizens.

CO5: Propose their outlook through exposure to new and different experiences and ideas and enrich their understanding of the issues under discussion.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Advanced Listening & Speaking Skills**	**12**
2	**Advanced Reading & Writing Skills**	**6**
3	**Art of Negotiation Skills**	**2**
4	**Email Etiquettes**	**2**
5	**Group Discussion**	**2**

B. DETAILED SYLLABUS

LIST OF LABS	
. 1.	Listening Skills II: Analysis of videos/audios by famous personalities
. 2.	Speaking Skills II: Extempore, Debate etc.
. 3.	Public Speaking: Key Concepts, Overcoming Stage Fear
. 4.	Story-Telling Skills: Techniques of Story Telling, Prompts for story creation
. 5.	Situational Conversational Skills
. 6.	PowerPoint Presentation Skills-II
. 7.	Reading Skills II: Technical Writings, Research Papers& Articles
. 8.	Writing Skills II: Blog Writing &Review Writing
. 9.	Picture Perception & Discussion
. 10.	Art of Negotiation: Identify the qualities of successful and unsuccessful negotiators. Identify different negotiation situations to practice during class.
. 11.	Email Etiquettes
. 12.	Group Discussion: Dos &Don'ts, Informal GD

Code: BESCES4401	TECHNICAL SEMINAR	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students will be able to:
CO1: Identify literature for review and research methods.
CO2: Apply knowledge and understanding in relation to the agreed area of study.
CO3: Communicate in written form by integrating, analyzing and applying key texts and practices.
CO4: Develop responses on the basis of the evaluation and analysis undertake.
CO5: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

A. OUTLINE OF THE COURSE

1	Dissertation consist of finalization of thesis based on literature review carried out during semester break of third year.
2	Objective finalization & presentation
3	Design & experimentation/survey details
4	Thesis preparation and submission
5	Final presentation

Code: BESCES4601	Talent Enrichment Programme (TEP-IV)	1 Credits [LTP 0-0-0]

OVERVIEW AND OBJECTIVES: The objective of Social Outreach, Discipline & Extra Curricular Activities is to provide students with the opportunities to enhance job-fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University.

TEP is integrated into the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories**.**

Social Outreach, Discipline &Extra Curricular Activities shall be evaluated irrespective of period/time allocation (as in the case of Extra Curricular activity) in the teaching scheme as 1 **credit** course. The record related to discipline, related activities are maintained for each student, and they shall be evaluated for the same. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of these classes shall be recorded and accounted in the total attendance.

Code: BESCES5101 ENVIRONMENTAL IMPACT ASSESSMENT 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The Students would be able:

CO1: Analyze the knowledge of the Environmental Impact Assessment.

CO2: Process includes in Environmental Impact.

CO3: Different types of methods used in Environmental Impact Assessment.

CO4: Point out the Basic principles of writing an EIS.

CO5: Introduce to Environmental Auditing the mechanism.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Introduction to EIA**	8
2.	**Process of EIA**	7
3.	**Methods used in EIA**	7
4.	**Differential Equations of Second Order & Special Functions**	7
5.	**Partial Differential Equations & Boundary Value Problems**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to EIA**
	• Introduction of unit • Definition of EIA • EIA and sustainable development • Need for EIA • EIA Notification 2006
2.	**Process of EIA**
	• Introduction of unit • Major Steps of EIA • Screening • Scoping • Collection of baseline information • Identification • Prediction • Evaluation
3.	**Methods used in EIA**
	• Introduction of unit • Adhoc approach • Overlay method • Questionnaire method • Checklist method • Network method • Matrix method

4.	**Preparation of Environmental Impact Statement**
	• Basic principles of writing an EIS • Phases of writing EIS: Initial planning phase, Detailed planning phase and writing phase
	•
5.	**Environmental Auditing**
	• Introduction of unit • Objectives of Environmental auditing • Importance of Environmental auditing • Steps of EA (outline)

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Human Development Centre, Human Development in South Asia	MahhubulHaq	2002	Oxford University Press
2.	Environmental Hazards- Assessing risk and reducing disaster	Smith, Keith	1996	London & New York
3.	Environmental Impact Assessment.	Canter, L.	1995	McGraw Hill
4.	Sustainable Development: Economics and Policy	Rao, P.	2000	Wiley Blackwell
5.	Introduction to Environmental Impact Assessment (Natural and Built Environment Series).	Glasson, J., Therivel, R., & Chadwick, A.	2012	Routledge

Code: BESCES5102	DISASTER MANAGEMENT	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The students will be able to:
CO1: Point out the manmade and natural disaster.
CO2: Explanation the Risk and Vulnerability Analysis
CO3: Point out the Concept, Nature and plan of Disaster Preparedness
CO4: Point out the Disaster Preparedness according to Communication, Participation, and Activation of Emergency.
CO5: Development of Long-term Counter Disaster Planning and Role of Educational Institute

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Introduction on Disaster**	8
2.	**Risk and Vulnerability Analysis**	7
3.	**Disaster Preparedness and Response Preparedness-I**	7
4.	**Disaster Preparedness and Response Preparedness-II**	7
5.	**Rehabilitation, Reconstruction and Recovery**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction on Disaster**
	• Introduction of the Unit • Different Types of Disaster : • Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc • Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc. Causes, effects and practical examples for all disasters. • Conclusion & real life application
2.	**Risk and Vulnerability Analysis**
	• Introduction of the Unit • Risk : Its concept and analysis • Risk Reduction • Vulnerability : Its concept and analysis • Strategic Development for Vulnerability Reduction • Conclusion & real life application
3.	**Disaster Preparedness and Response Preparedness-I**
	• Introduction of the Unit • Disaster Preparedness: Concept and Nature • Disaster Preparedness Plan

	• Prediction, Early Warnings and Safety Measures of Disaster. • Role of Information, Education, Communication, and Training • Role of Government, International and NGO Bodies. • Role of IT in Disaster Preparedness • Role of Engineers on Disaster Management • Conclusion & real life application
4.	**Disaster Preparedness and Response Preparedness-II**
	• Introduction of the Unit • Disaster Response : Introduction • Disaster Response Plan • Communication, Participation, and Activation of Emergency Preparedness Plan • Search, Rescue, Evacuation and Logistic Management • Role of Government, International and NGO Bodies • Psychological Response and Management (Trauma, Stress, Rumor and Panic) • Relief and Recovery • Medical Health Response to Different Disasters • Conclusion & real life application
5.	**Rehabilitation, Reconstruction and Recovery**
	• Introduction of the Unit • Reconstruction and Rehabilitation as a Means of Development. • Damage Assessment • Post Disaster effects and Remedial Measures. • Creation of Long-term Job Opportunities and Livelihood Options, • Disaster Resistant House Construction • Sanitation and Hygiene • Education and Awareness • Dealing with Victims' Psychology, • Long-term Counter Disaster Planning • 10. Role of Educational Institute • Conclusion & real life application

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	Disaster Management and Preparedness	Schneid, T.D. &Collins, L.	2001	Lewis Publishers, New York,NY
2	Introduction to International Disaster Management	Coppola D. P.	2007	Butterworth Heinemann
3	Hazards Vulnerability andEnvironmental Justice	Cutter, S.L.	2012	EarthScan, Routledge Press
5	Natural Hazards Analysis: Reducing the Impact of Disasters	Pine, J.C.	2009	CRC Press, Taylor and FrancisGroup

Code: BESCES5103	ORGANIC CHEMISTRY	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The students will be able to:

CO1: Familiarize basic concepts of structure elucidation of organic compounds using UV, IRand NMR spectroscopy.

CO2: Demonstrate comprehensive knowledge about Nuclear Magnetic Resonance spectroscopy and PMR spectra of organic compounds.

CO3: Apply mechanism of action of heterocyclic compounds in pharmaceutics/drugs.

CO4: Categories carbohydrates and structure determination of carbohydrates with conversion.

CO5: Explain the chemical nature of Amino Acids, Peptides and Proteins.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Electromagnetic Spectrum**	8
2.	**Nuclear Magnetic Resonance (NMR) spectroscopy**	7
3.	**Heterocyclic Compounds**	7
4.	**Carbohydrates**	7
5.	**Amino Acids, Peptides and Proteins**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Electromagnetic Spectrum**
	• Introduction to the Unit • **Electromagnnetic Radiation** • Origin of organic spectra, Types of energy changes, Types of molecular spectra, General instrumentation, absorbance and transmittance, line width. • **Ultraviolet Absorption Spectroscopy**- absorption laws (Beer-Lambert Law) molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, • Effect of solvents on transitions, effect of conjugation, concept of chromophore and auxochrome, bathochromic, hypsochromic and hyperchromic and hypochromic shifts, • UV spectra of conjugated enes and enones. • **Infrared Absorption Spectroscopy** – Theory-Absorption of infra radiation Molecular vibrations, Hookes law, selection rules, intensity and position of IR bands measurementof IR spectrum, finger print region, characteristic absorptions of various functional groupsand interpretation of IR spectra of simple organic compounds. • Conclusion & real life application.
2	**Nuclear Magnetic Resonance (NMR) spectroscopy**
	• Introduction to the Unit. • **Nuclear Magnetic Resonance (NMR) spectroscopy**: Principles of NMR spectroscopy, Larmor precession, chemical shift and low resolution spectra different scales, spin-spin coupling and high resolution spectra, interpretation of PMR spectra of organic molecules

	• Proton magnetic resonance (^{1}H-NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals. Interpretation of NMR spectra of simple organic molecules such as ethylbromide, ethanol, acetaldehyde, I,1,2-tribromoethane, ethyl acetate, toluene andacetophenone. • Conclusion & real life application
3	**Heterocyclic Compounds**
	• Introduction to the Unit. • **Heterocylic Compounds :** Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine • Methods of synthesis and chemical reactions, with particular emphasis on the mechanismof electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. • Comparison of basicity of pyridine, piperidine and pyrrole • Introduction to condensed five and six-membered heterocyclic compounds • Preparation and reactions of indole, quauinoline and isoquinoline • Mechanism of electrophilic substitution reactions of indole, quinoline and isoquionoline • Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher-indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. • Conclusion & real life application.
4	**Carbohydrates**
	• Introduction to the Unit • **Carbohydrates**: Classification, and General Properties • Glucose and Fructose (open chain and cyclic structure) • Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides • Structure of disacharrides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation • Mechanism of osazone formation. Epimers, anomers. Interconversion of glucose and fructose, chain lengthening and chain, shortening of aldoses. Erythro and threodiastereomers. Conversion of glucose into mannose.. Determination of ring size of monosaccharides. Formation of glycosides, ethers and esters. Cyclic structure of D (+)-glucose and fructose. Structures of ribose and deoxyribose. • Conclusion & real life application.
5	**Amino Acids, Peptides and Proteins**
	• Introduction to the Unit • **Amino Acids: Preparation** by Strecker synthesis using Gabriel's phthalimide synthesis.Zwitterion, Isoelectric point and Electrophoresis • Reactions of Amino acids: ester of –COOH group, acetylation of $–NH_2$ group,complexation with Cu^{2+} ions, ninhydrin test • Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. • Determination of Primary structure of Peptides by degradation- Edmann degradation (N terminal and C terminal) thiohydantoin and with carboxy peptidase enzyme • Synthesis of simple peptides (upto dipeptides) by N-protection (t- butyloxycarbonyl and phthaloyl) &C activating groups and Merrifield solid-phase synthesis

	• Amino Acids, Peptides, Proteins and its classification, structure and stereochemistry of amino acids. acid-basebehaviour, isoelectric point and electrophoresis. Preparation and reactions of alpha-amino acids. • Nucleic acids — Introduction, constituents of nucleic acids - nucleosides and nucleotides • Conclusion & real life application.

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	A Text Book of Organic Chemistry	O. P. Agarwal	Vol. I & II	Goyal Publication
2.	A Text Book of Organic Chemistry	B. S. Bahl and ArunBahl	Latest	S. Chand & Company Ltd.
3.	Organic Chemistry	S. M. Mukherji, S. P. Singh and R. P. Kapoor	Vol. I, II & III	Wiley Eastern Ltd. (New Age International)
4	Organic Chemistry	I.L. Finar	Vol.-I & II	Pearson Education, Asia

Code: BESCES5104	OOPS USING JAVA	3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Student would be able to do:

CO1: Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.

CO2: Understand dynamic memory management techniques using pointers, constructors, destructors

CO3: Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.

CO4: Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

CO5: Demonstrate the use of various OOPs concepts with the help of Java Programming.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction to Object Oriented Programming**	8
2	**Basic Java Programming**	10
3	**Java Packages and Interfaces**	10
3	**Exceptions and I/O Handling**	10
5	**User Interface and Advanced Concepts**	10

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Object Oriented Programming**
	• Introduction to Unit • Classes and Objects • Object Oriented Programming Concepts • Access Specifiers and Access Modifiers • Introduction to Java, Java Virtual Machine • Conclusion of the Unit
2.	**Basic Java Programming**
	• Introduction to Unit • Variables • Data Types • Control flow statements – if, else, switch, for, while • Arrays • Strings • Conclusion of the Unit
3.	**Java Packages and Interfaces**
	• Introduction to Unit • Java classes, Java methods, Packages, Interfaces • Java.util, java.io, java.net, java.sql, java.applet, etc • Collection Framework • Generics • Wrapper classes • Conclusion of the Unit

4.	**Exceptions and I/O Handling**
	• Introduction to Unit • Errors and Exceptions • Exception handling • Streams, Readers and Writers • Programming with Files • Multithreaded programming • Networking – Socket Programming • Conclusion of the Unit
5.	**User Interface and Advanced Concepts**
	• Introduction to Unit • User Interface Components • AWT • Swing • Event Handling • Layouts, Forms • Applets • Annotations • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Publication
1	Java Complete Reference	Herbert Schildt	TMH
2	SAMS teach yourself Java-2	Rogers Cedenhead and Leura Lemay	3rd Edition, Pub. Pearson Education.

Code: BESCES5201 ENVIRONMENTAL SCIENCE LAB-V 1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Understand the procedure for taking good soil sample.

CO2: Explain the principles of the soil analysis to reduce the environmental impacts due tosoil amendments.

CO3: Acquire the ability to understand, explain and use instrumental techniques for soilanalysis

CO4: Interpretation of satellite imagery.

CO5: Apply subject knowledge and skill to Interpret complex satellite imaginary.

1	Determination of pH of in soil
2	Determination of moisture percentage in soil
3	Determination of calcium and magnesium in soil
4	Determination of organic carbon in soil
5	Determination of conductivity of soil
6	Extraction of trace elements with EDTA in soil
7	Determination of Nitrite Nitrogen in Soil/Water
8	Interpretation of Satellite imagery for Identification of water resources
9	Interpretation of Satellite imagery for Urban Planning
10	Interpretation of Satellite imagery for Classification and identification of vegetation cover
11	Report on role of Remote Sensing in Disaster Management
12	Prediction of drought based on soil moisture index using remote sensing data

Code: BESCES5202	CHEMISTRY LAB-V	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOMES: Students would be able to:

CO1: Understand chemical and molecular processes that take place in organic chemicalreactions in synthesis.

CO2: Explain the principles of the chromatographic techniques.

CO3: Acquire the ability to understand, explain and use instrumental techniques for chemicalanalysis

CO4: Prepare water quality assessment report

CO5: Apply subject knowledge and skill to solve complex problems with defined solutions

1	Synthesis of p bromoacetanalide
2	Synthesis of p-nitroacetanalide
3	Benzolytation of Aniline
4	Paper chromatographic separation of compounds in Spinach plant
5	To separate a mixture of sugar by paper chromatography
6	Synthesis of Aspirin
Physical Chemistry	
7	To determine the heat of neutralization for strong acid and strong base
8	Potentiometric measurements-Strong acid with strong base.
9	To study the saponification of ethyl acetate conductmetrically
10	Study the variation of surface tension with different concentration of detergent solutions. Determine CMC.
11	To separate mixture of organic compounds by solvent extraction.
12	Determination of conductivity, molar conductivity, degree of dissociation and dissociation constant ofa weak acid.

Code: BESCES5203	JAVA PROGRAMMING LAB	1.0 Credit [LTP: 0-0-2]

COURSE OUTCOME: Student would be able to:

CO1: Implement object oriented programming concept using basic syntaxes of control structure, stringsand function for developing skills of logic building activity.

CO2: Identify classes, objects, members of a class and the relationships among them needed for afinding the solution to specific problem.

CO3: Demostrate how to achieve reusability using inheritance interfaces and packages and describesfaster application development can be achieved.

CO4: Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

CO5: Identify and describe common abstract user interface comments to design GUI in JAVA usingApplet & AWT along with response to events.

Part A	
	1. A. Write a program to print "Hello World" in Java. . B. Write a program to add two numbers C. Write a program to demonstrate the different access specifiers 2. A. Write a program to demonstrate inheritance, abstraction, encapsulation and polymorphism. B. Write a program to find the factorial of n numbers C. Write a program to calculate Fibonacci series D. Write a program to add n numbers and series 3. A. Write a program to create an array and store elements into the array. B. Write a program to find the sum of elements in an array C. Write a program to demonstrate switch case, if, if-else and for loop. 4. A. Write a program to demonstrate the working of methods. B. Write a program which has four methods – add (), subtract (), multiply () and divide ()and demonstrate a simple console calculator. C. Write a program to accept command line arguments and display them to the user Write a program which uses different packages 5. A.Write a program to create a package. B. Write a program to handle different exceptions 6. A. Write a program to demonstrate try-catch, throw and throws. B. Write a program to accept input from the user using streams
Part B	
	7.Write a program to read a file 8.Write a program to write into a file 9.A. Write a program to demonstrate client server communication (socket programming) B. Write a program to create threads and manipulate them 10. Write a program to create a user interface to check user authentication. 11. Write a program to create a registration form and save the details into a file 12. Write a program to create a small animation using applets

Code: BESEES5201 FUNDAMENTAL OF CLOUD COMPUTING 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES: Student would be able to:

CO1: Compare the strengths and limitations of cloud computing

CO2: Identify the architecture, infrastructure and delivery models of cloud computingCO3: Apply suitable virtualization concept.

CO4: Choose the appropriate cloud player, Programming Models and approach.

CO5: Address the core issues of cloud computing such as security, privacy and interoperabilityDesign Cloud Services and Set a private cloud

A OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Linear Programming**	9
2	**Simplex Method**	6
3	**Transportation Problem**	6
4	**Assignment Problem**	8
5	**Game Theory**	7

B DETAILED SYLLABUS

Unit	Unit details
1	**Linear Programming**
	• Introduction to Unit • Concept of optimization, • Linear Programming: Introduction, Formulation of a Linear Programming Problem (LPP), • Requirements for an LPP, Advantages and limitations of LP. • Graphical solution, Multiple, unbounded and infeasible solutions. • Conclusion & real life application
2	**Simplex Method**
	• Introduction to Unit • Principle of simplex method: standard form, basic solution, basic feasible solution. • Computational Aspect of Simplex Method: Cases of unique feasible solution, nofeasible solution, • Multiple solution and unbounded solution and degeneracy • Two Phase method, Duality in LPP, primal-dual relationship • Conclusion & real life application
3	• **Transportation Problem**
	• Introduction to Unit • Transportation Problem: Methods for finding basic feasible solution of a transportation problem • Modified distribution method for finding the optimum solution • Unbalanced and degenerate transportation problems • Conclusion & real life application
4	**Assignment Problem**

	• Introduction to Unit • Assignment Problem: Solution by Hungarian method, • Unbalanced assignment problem, maximization in an assignment problem, • Crew assignment and travelling salesman problem. • Conclusion & real life application
5	**Game Theory**
	• Introduction to Unit • Game Theory: Two Person zero sum game • Game with saddle points, the rule of dominance • Algebraic, graphical and linear programming methods for solving mixed strategy games • Conclusion & real life application

C RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Operations Research – An Introduction	H.A. Taha	**3rded**	Pearson, India
2.	Operations Research	KantiSwarup, P.K. Gupta and Manmohan.	2nd Ed	S. Chand publication Delhi
3.	Operations Research	P.K. Gupta and D.S. Hira	2016	S. Chand & Co. Delhi

Code: BESEES5102	DATA STRUCTURE	3 Credits [LTP: 3-0-

COURSE OUTCOMES: Students will be able to:

CO1: Define the concepts of array, Linked List and Interpreting their applications.
CO2: Apply the concepts of Trees with the help of example.
CO3: Differentiate between the sorting and has thing with their applications
CO4: Analyze the role of algorithms in computing with example.
CO5: Apply the Elementary Graph Algorithms with example in real problems.

A. OUTLINE OF THECOURSE

Unit	Title of the unit	Time required for the Unit (Hours)
1.	Introduction And Basic Data Structures	7
2.	Advanced Data structures	9
3.	Sorting And hashing	10
4.	Algorithm design techniques	9
5.	Graphs algorithms	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction And Basic Data Structures**
	• Introduction of Unit • Problem solving techniques and examples • Abstract Data Type (ADT)-The list ADT Arrays- Stacks and Queues: Implementation and Application, Circular Queues. • Conclusion and Summary of Unit
2.	**Advanced Data structures**
	• Introduction of Unit • Trees: Preliminaries-Binary Tree- Tree traversals-Binary search Trees-AVL Trees. • Conclusion and Summary of Unit
3.	**S sorting And hashing**
	• Introduction of Unit • Sorting by Selection- Sorting by Insertion- Sorting by Exchange- Sorting by Diminishing Increment-Heap • Sort- Heaps Maintaining the Heap Property-Building a Heap- Heap sort Algorithm-Quick sort- • Description-Performance of quick sort-Analysis of Quick Sort. Hashing - General idea-Hash functions- • Separate Chaining-Open Addressing-Rehashing-Extendible Hashing. • Conclusion and Summary of Unit
4.	**Algorithm design techniques**
	• Introduction of Unit • The role of algorithms in computing-Getting Started-Growth of functions. Divide and conquer dynamic • programming-Greedy Algorithm –Backtracking • Conclusion and Summary of Unit
5.	**Graphs algorithms**

	• Introduction of Unit • Elementary Graph Algorithms-Minimum Spanning Trees-Single-source shortest paths- • All pairs shortest paths. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Havowitz & Sawhni	Data Structures in C &	2nd	BPB Publication
2	Data Structures in Pascal	Havowitz &Sawn	2nd	BPB Publication
3	Data Structures in C	Tannenbaum	3rd	PHI
4	Data Structures and Algorithms	PAI	3rd	TMH
5	Introduction to Data Structures with Applications	TREMBLAY	2nd	TMH

Code: BULCHU5201	PROFESSIONAL SKILLS-I	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Compare the professional and personal approach towards any task and demonstrate their understanding by displaying professional attitude in the assigned tasks.

CO2: Recognize, explain, and use the formal elements of specific genres of organizational communication: reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents etc..

CO3: Prepare and deliver a clear and fluent demonstrative, informative, and persuasive presentation and enlarge their vocabulary by keeping a vocabulary journal.

CO4: Demonstrate preparedness for any type of interview from classic one-on-one interview to panel interviews,Phone/Skype interviews, Behavioral/Situational etc. along with sharping the ability to critically analyze a given piece of information and collectively work in a group to arrive at a solution or develop a perspective.

CO5: Understand negotiation and time management to identify steps for proper negotiation preparation & learn bargaining techniques and strategies of inventing options for mutual gain and move negotiations from bargainingto closing.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Professional Attitude & Approach**	**6**
2	**Professional Writing-I**	**8**
3	**Presentation Skills: Structure Study**	**2**
4	**Interview Skills & Group Discussion**	**4**
5	**Negotiation Skills & Time Management**	**4**

B. DETAILED SYLLABUS

LIST OF LABS	
1.	Professional & Ethical Approaches : Degree of adherence, Business world & meeting deadlines
2.	Job Hunting and Networking: Skill Branding & Usage of Online Platforms
3.	Trust Building & Cultural Etiquettes
4.	Professional Writing-I: Direct-Indirect approaches to Business Writing-Five main stages of writing Business Messages.
5.	Professional Email Writing
6.	Resume Building-I: Difference between C.V. & Resume, formats, points to cover, practice sessions
7.	E-Learning & E-Content Development-I
8.	Presentation Skills: format & structure of presentations, using tools & techniques
9.	Job Interviews I: Preparation and Presentation
10.	Advanced Group Discussion – I
11.	Negotiation Skills & and Conflict Resolution-I
12	Professional Code of Ethics & Effective Time Management

Code: BESCES5401 INDUSTRIAL TRAINING & SEMINAR 6 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students will be able to:

CO1: Develop advanced and lifelong learning skills.

CO2: Extend the boundaries of knowledge through research and development.

CO3: Write formatted report for explaining the work during industrial training and describingthe experience.

CO4: Understand basis of professional practice, administrative functions and company culture.

CO5: Develop greater clarity about academic & career goals and explore options in careerplans.

A. **OUTLINE OF THE COURSE**

1	At the end of the Fourth Semester each student would undergo Industrial Training in an Industry/ Professional Organization / Research Laboratory with the prior approval of the Headof Department and Training & Placement Officer for two months.
2	Students shall be required to submit log book and certificate from the organization and power point presentation based on the training.
3	Students shall be required to submit a written typed report and power point presentation based on the training.
4	Students shall be required to give the presentations in the allotted period about the training attended after 4th Semester.
5	The evaluation shallbedone as per continuous evaluation process during Vth semester by the respective department and the marks/result shall be notified accordingly. A department specific panel comprising of HOD/Sr. Faculty/ Project Coordinators shall judge each individual student for the above-mentionedwork. The departmental panel shall display the proper schedule for the class/ one to one interaction/presentation for all the students.

Code: BESCES5601	Talent Enrichment Programme-V	(TEP-V) 1 Credit

OVERVIEW AND OBJECTIVES The objective of Discipline and TEP is to provide students with the opportunities to enhance job-fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment inthe University.

TEP is integrated into the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories.

Discipline and Talent Enrichment Programme (TEP) shall be evaluated irrespective of period/time allocation (as in the case of Extra Curricular activity) in the teaching scheme as 1 credit course. The record related to discipline, related activities aremaintained for each student, and they shall be evaluated for the same. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of these classes shall be recorded and accounted in the total attendance.

Code: BESCES6101 ENVIRONMENTAL LEGISLATION & CONTEMPORARY ENVIRONMENTAL ISSUES 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES

Students will be able to:

CO1: Point out the global environmental problems like ozone layer depletion, greenhouse effect.
CO2: Discussion of the environmental protection act and need for environmental legislations.
CO3: Point out the water quality parameters of drinking water and Salient features of water(prevention and control of pollution) Act.
CO4: Point out the water quality parameters of drinking water and Salient features of air (prevention and control of pollution) Act.
CO5: Discussions for the protection of forests and national forest policy.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Global Environmental Problems**	7
2.	**Legal Provisions for Environmental Protection in India**	6
3.	**Legal Aspects of Water Pollution**	8
4.	**Legal Aspects of Air Pollution**	8
5.	**Protection of Forests**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Global Environmental Problems**
	• Introduction of the Unit • Ozone layer depletion • Green House Effect • Acid rain • Smog • Deforestation • Desertification • Climate change • Conclusion & Real life applications
2.	**Legal Provisions for Environmental Protection in India**
	• Introduction of the Unit • Need for Environmental Legislations • Environment and constitution of India(Article 48 A and 51A) • Environmental Protection Act, 1986-Salient features and major objectives • Conclusion & Real life applications
3.	**Legal Aspects of Water Pollution**
	• Introduction of the Unit • Standard quality parameters of potable water: IS 10500 • The Water (Prevention and Control of Pollution) Act1974-Salient features & major objectives • Conclusion & Real life applications

4.	**Legal Aspects of Air Pollution**
•	• Introduction of the Unit • Standard quality parameters of ambient Air • The Air (Prevention and Control of Pollution) Act, 1981-Salient features & major objectives • Conclusion & Real life applications
5.	**Protection of Forests**
	• Introduction of the Unit • Present status of forests in India • The National Forest Policy-Major objectives • The Forest(Conservation) Act,1980-Major objectives • Conclusion & Real life applications

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	*Living In The Environment*	Miller, T.G., S. E.	2012	Usa: Brooks/Cole Cenage Learning
2.	*Environmental And Pollution Science*	Pepper, I., C. P.	2006	Academic Press
3.	*Environmental Pollution And Control*	Pierce, J., R. E.	1998	Usa: Butterworth-Heinemann (Elsevier)
4.	*Environmental Chemistry*	Kaur, H.	2014	Meerut: Pragati Prakashan
5.	*Air Pollution*	Rao, M.N., H. R.	1989	New Delhi: Tata Mcgraw Hill Publishing Company Limited
6.	*Environmental Science: A Global Concern*	Cunningham, W. P., & Cunningham, M. A.	2012	The McGraw-Hill Companies, Inc.

Code: BESCES6102 PHYSICAL CHEMISTRY 3.0 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

The students would be able to:

CO1: Evaluate photochemical and photophysical processes using Jablonski diagram and their quantum yield expressions.

CO2: Rationalize the selection rules in rotational and vibrational spectra.

CO3: Describe the fundamental concepts of electrochemistry and relate the conductivity of an electrolyte with its concentration.

CO4: Outline the mechanisms of unimolecular and bimolecular reactions at surfaces using Gibbs, Freundlich and Langmuir isotherm.

CO5: Differentiate between classical and quantum mechanics and solve the Schroedinger equation to obtain wave functions for some basic, physically important types of potential in one dimension, and estimate the shape of the wave function.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Photochemistry**	7
2.	**Spectroscopy**	8
3.	**Electrochemistry**	7
4.	**Adsorption**	6
5.	**Quantum Mechanics**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Photochemistry**
	• Introduction to the Unit. • **Photochemistry:** Interaction of radiation with matter, difference between thermal and photochemical processes. • Laws of photochemistry: Grothus-Drapper law, Stark-Einstien law • Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non radiative process (internal conversion, inter system crossing) quantum yield, photosensitized reaction-energy transfer process (simple examples) • Conclusion & real life application
2.	**Spectroscopy**
	• Introduction to the Unit. • **Spectroscopy I:** Electromagnetic radiation of the spectrum, basic features of different spectrometers, statement of the Born Oppenheimer approximation, degree of freedom. • Rotational spectrum: Diatomic molecules, Energy levels of rigid rotator, (semiclassical principles) selection rules, spectral intensity, distribution using population distribution (Maxwell Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotator, isotope effect. • Vibrational spectrum: Energy levels of simple harmonic oscillator, selection rules, pure

	vibrational spectrum, intensity, determination of force constant, qualitative relations of force constants and bond energy, effect of anharmonic motion and isotopes on the spectrum, idea of vibrational frequencies of different functional groups. • Conclusion & real life application
3.	**Electrochemistry**
	• Introduction to the Unit • 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 and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes. Ostwald 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. • Types of reversible electrodes, gas metal ion, metal-metal ion, metal insoluble salt-anion and redox electrodes. • Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrodepotential, sign convention, electrochemical series and its significance. • EMF of a cell and its measurements. Computation of cells EMF. Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), • Conclusion & real life application
4.	**Adsorption**
	• Introduction to the Unit. • **Adsorption:** Difference between adsorption, absorption and sorption, Chemisorption, adsorbent and adsorbate, reversible and irreversible adsorption, • Characteristics of adsorption ,adsorption of gases by solids, factors affecting adsorption, types of adsorption • Types of adsorption isotherms;Freundlich and Langmuir adsorption isotherms, Adsorption Techniques, Some important adsorbents used in industries, Application of adsorption. • Conclusion & real life application
5.	**Quantum Mechanics**
	• Introduction to the Unit • **Quantum Mechanics I:** Black body radiation, Planck`s radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects. • Compton Effect. De Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particlein a one dimensional box. • Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions. • Conclusion & real life application

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Fundamentals of Molecular Spectroscopy	C. M. Banwell and E. McCash	4th Edition	Tata McGraw Hill
2.	Spectrometric Identification of Organic Compounds	Robert M. Silverstein, Francis X. Webster, David Kiemle	7th Edition	Wiley
3.	Applications of Spectroscopic techniques in Organic Chemistry	P.S. Kalsi	6th Edition	New Age International
4	Physical Chemistry	Bahl and Tuli	Latest	S. Chand

Code: BESCES6103 PYTHON PROGRAMMING 3 credit [LTP: 3-0-0]

COURSE OUTCOME:

The students would be able to:

CO1: Write, Test and Debug Python Programs
CO2: Create, Implement Conditionals and Loops for Python Programs
CO3: Apply use functions and represent
CO4: Compound data using Lists, Tuples and Dictionaries
CO5: Apply Read and write data from & to files in Python

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Introduction to Python Environment**	07
2.	**Data Structures, Looping and Branching**	08
3.	**List, Tuple, Dictionary and sets**	08
4.	**File Handling using Python**	07
5.	**Python for statistics and Data Management**	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Python Evironment**
	• Introduction of unit • History and development of Python • Working with Python : Getting the language, Understanding the need for indentation, Working at the command line taste or in the IDE, • Compiler vs. Interpreter level languages • Installing python on Windows, Linux and MAC • Conclusion of Unit
2.	**Data Structures, Looping and Branching**
	• Introduction of Unit • Working with Numbers and Logic, Performing variable assignments, Doing arithmetic, Comparing data using Boolean expressions, • Creating and Using Strings, • Creating and Using Functions, Calling functions in a variety of ways, • Using Conditional and Loop Statements, Making decisions using the if statement, Choosing between multiple options using nested decisions, Performing repetitive tasks using for, Using the while statement, • Conclusion of Unit

3.	**List, Tuple, Dictionary and sets**
	• Introduction of Unit • Storing Data Using Sets, Lists, and Tuples : Performing operations on sets, • Working with lists, Creating and using Tuples, Defining Useful Iterators, Indexing Data Using Dictionaries • Pre-built functions of List, Tuple, Dictionary and Set • Conclusion of Unit
4.	**File Handling using Python**
	• Introduction of Unit • Python File Operation :Reading config files in python -Writing log files in python • Understanding read functions, read(), readline() and readlines() • Understanding write functions, write() and writelines() – • Manipulating file pointer using seek -Programming using file operations • Conclusion of Unit
5.	**Python for statistics and Data Management**
	• Introduction to the unit • Reading CSV files and Excel files. Reading excel files sheets • Finding Mean, Median, Mode and its importance in data analysis. • Numpy and Pandas. Creating arrays and using array functions • Creating Data frames and using data frame functions, • Creating data frame using dictionary • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Python for Data Science for Dummies	Luca Massaron andJohn Paul Mueller	First Edition	John Wiley& Sons, Inc.
2.	Python for Data Analysis	Wes McKinney	First Edition	O'Reilly Media, Inc.

Code: BULCHU6201`	PROFESSIONAL SKILLS-II	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students would be able to:

CO1: Learn how to update and manage the experience, education, and skills & expertise sections onsocial media & formulate appropriate updates as a means to promote business activities.

CO2: Understand how to leverage grammar and formatting in formal documents & demonstrate howto follow the stages of the writing process

CO3: Evaluate presentation's weak spots and areas for improvement & learn, practice and acquire theskills necessary to deliver effective presentation with clarity and impact.

CO4: Evaluate basic factors such as personal skills & abilities, career fields, willingness to learn andstrengthen the chances to get desirable jobs.

CO5: Understand negotiation and team skills dynamics and how to prepare for uncertainty & learn tocraft agile strategy and be quick on your feet in changing circumstances.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Personal Branding**	2
2	**Professional Writing-II**	8
3	**Presentation Skills: Professional Setting**	2
4	**Job Interview & Group Discussion : Preparation by Mock Practice**	4
5	**Negotiation Skills, Team Management & Professional Awareness**	8+

B. DETAILED SYLLABUS

LIST OF LABS	
1.	Personal Branding : Its best practices
2.	Professional Writing II: Abstract Writing, Statement of purpose and other formal documents
3.	Expanding Professional Vocabulary
4.	Resume Building-II: Revising & Updating
5.	E-Learning & E-Content Development-II
6.	Presentation Skills in Professional Setting
7.	Job Interviews II: Preparation and Presentation for Mock Interviews
8.	Advanced Group Discussion-II: Analysis of professional GD Videos and Practices on Topics/Video/Article based topics
9.	Negotiation Skills & and Conflict Resolution-II
10.	Change and Transition Management
11.	Team Building Strategies: Project Management
12.	Career Awareness & Productive Mindset

Code: BESCES6401	DISSERTATION	8 Credits [LTP: 0-0-14]

COURSE OUTCOMES:

Students would be able to:
CO1: Identify literature for review and research methods.
CO2: Apply knowledge and understanding in relation to the agreed area of study.
CO3: Communicate in written form by integrating, analysing and applying key texts and practices.
CO4: Develop responses on the basis of the evaluation and analysis undertake.
CO5: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

A. OUTLINE OF THE COURSE

1	Dissertation consist of finalization of thesis based on literature review carried out during semester break ofthird year.
2	Objective finalization & presentation
3	Design & experimentation/survey details
4	Thesis preparation and submission with plagiarism report
5	Final presentation

Code: BESCES6601	Talent Enrichment Programme (TEP-VI)	1Credit

OVERVIEW AND OBJECTIVES The objective of Discipline and TEP is to provide students with the opportunities to enhance job-fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University.

TEP is integrated into the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories.

Discipline and Talent Enrichment Programme (TEP) shall be evaluated irrespective of period/time allocation (as in the case of Extra Curricular activity) in the teaching scheme as 1 credit course. The record related to discipline, related activities aremaintained for each student, and they shall be evaluated for the same. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of these classes shall be recorded and accounted in the total attendance.